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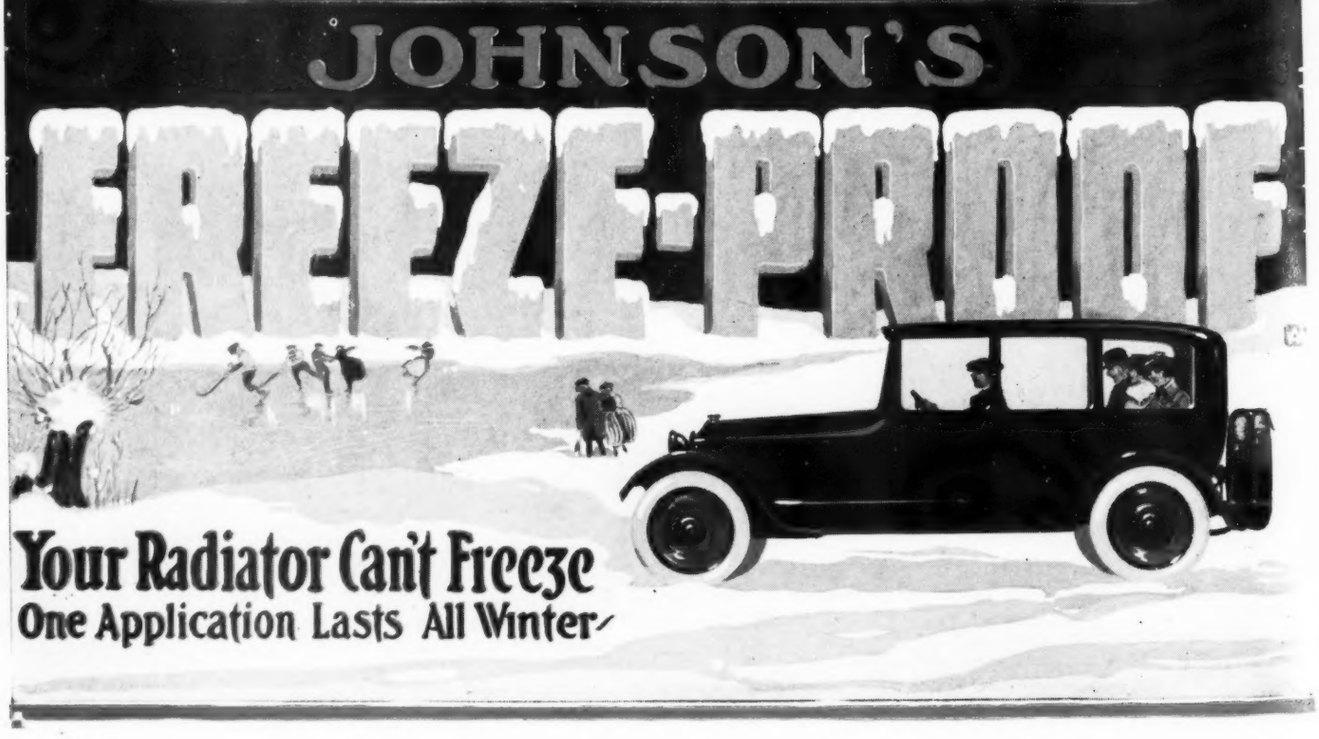


AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

VOL. XXXIX NEW YORK, THURSDAY, OCTOBER 24, 1918—CHICAGO No. 17

Extracts from Senate Aircraft Report Testimony

Indicate Predjudice Against Automobile Industry and Disclose How Report Was Not a Fair Deduction from the Evidence—Credit Should Have Been Given Where It Was Due

WHILE waiting for the Hughes aircraft report, which is expected at almost any time, a careful perusal of the 1200 pages of evidence taken by the Senate Military Affairs subcommittee in the investigation which resulted in its report establishes more and more the conviction that the final report failed to represent the bulk of the evidence. The report was highly prejudiced against the automobile industry and as such told only one side of the story, leaving the other hidden in the report of the hearings.

Without mention of the numerous facts that testify to the loyalty, the willingness, the sacrifices and the RESULTS achieved by the automobile industry as told in the testimony, without comment in the report of the numerous delays caused by army officials and civilians in the Government employ who never were connected with the automobile interests, the comparison of the testimony with the report creates the impression that exaggeration and possibly prejudice entered into its compilation.

Thorough reading of the voluminous testimony develops several outstanding features:

a—Complete ignorance of many army officers, in aviation work, with aeronautics.

b—Appointments of army officers to important aeronautical work who were in no way familiar with their duties.

c—That the automobile industry has been most patient, active and efficient in view of the ignorance, delays, procrastination and indecision it encountered.

d—That the blame attached to the automobile industry seems to be based chiefly upon the words of a few concerns envious both of the facilities of the automobile industry and its ability to handle aircraft business.

e—That several of the Senators were more anxious to find evidences of graft than means for improving the aircraft program, although their mission was in no way to be related with the Hughes inquiry into the possible dishonesty of officials.

f—That the Liberty engine is without doubt the peer of all aviation engines.

g—That the statements made in Congress that no airplanes reached France prior to July 1 from America were untrue.

h—That the word of a single official has been accepted as the basis for wholesale denunciation of the members of the original Aircraft Board.

i—That in its anxiety to make a report severely critical much that was to be commended was left unsaid.

First to emphasize themselves to the reader because of their absence in the report are the numerous statements in the testimony that reflect great

credit on the automobile industry, and second comes the ignorance charged in the report to the automobile industry and actually merited only by the army officials and Government civilian employees who, in the main, were never connected with the automobile industry.

The Senate Committee visited the many plants throughout the country engaged in war and aircraft work. One of the first was Packard, where the committee learned of the invaluable work performed by the company in its early experiments on a Packard aviation engine and which work gave J. G. Vincent the experience that aided him in his share of the designing of the Liberty engine. They were told of the patents in the Liberty engine held by Packard "given without cost to the Government." They heard of the important services by Vincent given to the Government while he was in the pay of Packard, and how until he actually accepted a commission in the army, Packard donated his services to the nation.

Ford Ahead of Schedule

At Ford's the committee learned that in addition to the vast war work the company is doing other than in aviation, it holds a contract for hundreds of thousands of Liberty engine cylinder forgings, and that the company was not only up to the minute on its contract, but could complete it faster than the Government could consume the product. They heard also that the company installed new machinery for the work.

The General Motors Corp., the committee was told, built a plant especially for the aviation work and at the time of the investigation was up to 100 per cent production on many parts of the Liberty engine and close to that figure on the others. The committee was told, and no mention was made in the report, of the critical hindrance to production created by army officers who visited the plant and enticed the important workers away by telling them they could avoid trench service if they enlisted for repairshop work abroad.

The committee was told, and made no mention in the report, of the keen competition for workers among various concerns in the country and the need for Government control of the labor situation.

No mention was made in the report about the fact that the Cadillac delay in Liberty engine production was due to the fact that all its tool-room capacity had already been given over to other Government war work. No mention was made that Cadillac was at the same time turning out 3,000,000 airplane parts for the Fisher Body Co., besides thousands of micrometer gages for the Liberty truck. And no mention is in the report of the "splendid co-operation between the various automobile companies" engaged in Liberty engine production in the exchanging of surplus parts, thus increasing the outputs.

At the Lincoln plant the committee learned and never mentioned that Lincoln was started as a patriotic venture with the outbreak of the war because the founders believed manufacturers should be ready to aid the Government. They learned that the Lelands invested over $2,000,000 in the establishment of the plant, which cost was not in any way figured in when the cost-plus contracts were made. Also, they heard how the Lincoln company sent representatives to all sections of the country, visiting 83 factories to secure the tool-makers necessary for the Liberty engine work. And the report did not tell how the Government itself delayed the company by its ignorance of whether it would use an eight or twelve-cylinder engine. And they did not report that the company shipped 236 engines complete and perfect by June 1, and was quickly nearing schedule production.

No mention was made of how the Fisher Body Co. lost 2 months in production and was forced to cut down its organization from 800 men to 200 men because following receipt of a contract only 5 per cent of the drawings arrived from the Government and were followed by changes ordered almost daily, or how W. C. Potter, who lately has been Acting Chief of Aircraft Production, testified that the Fisher Body Co. was "doing wonderful," or how Captain D'Annunzio of the Italian Mission told that the Fisher Body Co. "had a very good plant."

The committee heard from C. F. Kettering, a recognized engineer of automobile parts and a member of the Dayton-Wright Airplane Co., how his every suggestion was turned down by army men with the statement that "it would not work."

Board of Competition

And at this part of the testimony Senator Chamberlain himself said that, because of the testimony, the situation could be compared to that of the Ordnance Department of a year previous, when "its proper purpose was to furnish the American Army with the best practical equipment that would be up to date, but instead of performing that function they had long ago resolved themselves into a board of competition with the inventive genius of the world."

And in the report is no mention of the statement by Senator New of Indiana, who testified that at Nordyke & Marmon "I found the company very greatly embarrassed and their work seriously retarded through their inability to receive deliveries of tools at an early date, but this embarrassment has been overcome and the plant is now ready to begin deliveries at an early date." He also told that Walter Marmon stated that one of the greatest difficulties was caused by interference with the work by the Government itself, particularly the Ordnance Department, which stopped workmen making tools and diverted their activities.

It may be that the report intended in its criticism of the automobile industry to blame only those members of the industry who were officially connected with the Government in its aircraft program. This inference may seem warranted by the severe denunciation given later in the report to those men. But it is not warranted by the testimony which shows that the actual aircraft program and actual production were the direct work of the Signal Corps under General George O. Squires and that this section in the reorganization came in under the name of the

Bureau of Aircraft Production, the body that is actually responsible for the placing of contracts and the inspection and production. In the original body under General Squires this was known as the Equipment Division and it included within its reorganization practically every man who had served under the General. John D. Ryan, testifying that this was the body that actually made contracts and purchases, and which was, therefore, the one to be held responsible, told that it included W. C. Potter, formerly with the Guggenheims in mining and metallurgy; Kellog, Potter's assistant and a metal manufacturer; Colonel Mixter, formerly with the John Deere Plow Co., and in charge of production; Major Wold, formerly a certified accountant and in charge of finances; Major Downey, a Regular Army officer, in charge of disbursements. All of these men, with the exception of Colonel Mixter, who was replaced by A. A. Landon of the American Radiator Co., are still holding the same positions. None were automobile men.

Where the Denunciation Originated

The denunciation of the automobile interests seems, after perusal of the report, to be founded upon the testimony of H. B. Mingle, president of the Standard Aircraft Corp., Elizabeth, N. J., who laid stress on the fact that the automobile industry was considerably interested in this aircraft production and was trying to monopolize it. It may also have been occasioned by the possible misunderstanding of the committee that such concerns as the Excelsior Mfg. Co., making an inferior engine in the "Lawrance motor," were automobile concerns. The Standard Aircraft Corp., which complained of the automobile industry interest in aircraft, is a company financed by Mitsui & Co., Japanese bankers, who hold the $2,000,000 preferred stock of the company, and who, according to the testimony, were also the paymasters for the German secret service prior to the war. This concern, now engaged in making airplanes for Japan, was criticised as inefficient by Major C. B. Rose, who told that the company was trying to make De Havilands, H.I I-L navy boats, J.R. I-B training planes, flying boats for Japan, Handley-Page planes and M. defense planes at one time. This concern is the one, also, that caused Captain D'Annunzio the impression that Capronis could be built there quickly in quantity, by its promises. The president of this company, according to the testimony, was a lawyer prior to the war and without manufacturing experience, whose salary of $62,000 as president of the company is figured into the cost-plus contract the company holds with the Government.

Further, the Senate report does not tell in any detail of the ignorant army officers placed in important positions and who delayed the air program. It does not tell of the testimony of W. F. Parish, chief of the oil and lubrication section, Bureau of Aircraft Production, who told that engineers at the various fields were men who had been given a hurried 3-months course in engineering at the Massachusetts Institute of Technology and other institutions, men who prior to holding these important places were bill clerks in freight offices, grocery clerks, wooden box makers, bond salesmen and others who had been in occupations in no way connected with engineering.

There was also criticism of the automobile men by Col. T. H. Bane, who complained that the automobile engineers assumed they could make airplanes without reference to men who are practical fliers and aeronautical engineers. He did not tell which aeronautical engineers in this country had been ignored. He probably referred to himself and other fliers in his statement, which brings to mind the possible analogy of asking a chauffeur to collaborate with an automobile engineer in the design of a machine.

Other Reasons for Delay

Other reasons for the delay in the program revealed in the testimony and in some instances touched upon by the report include the difficulties encountered by the Curtiss Aeroplane & Motor Corp. where a contract was received from the Signal Corps for Spad airplanes on Sept. 19, 1917, following which the company started tooling up and got in such shape they could have completed the order, according to the testimony, by February, 1918. On Oct. 2, 1917, the company received a telegram ordering modifications in the plane to adapt it to the Marlin machine gun, which caused delay. On Oct. 10, when 1500 drawings had been completed, new orders called for the use of the Vickers gun instead of the Marlin and this meant new drawings. On Oct. 22, 1875 drawings were ready and the company awaited the list of materials as used by France in the Spad. These were secured on Oct. 27, when the company wired for instructions to go ahead with the contract. Washington did not reply, and finally, on Nov. 7, orders were received to withhold all work on Spads, and no work has since been done on this contract. On Sept 15, 1917, Curtiss also received an order for 500 Caproni planes, on which it has never been able to get the "go ahead" orders. And according to George H. Mueller, chief engineer of the company, when they finally received an order for Bristol airplanes they were so troubled with changes ordered by the Government (which amounted to more than 1200 in March, 1918, alone) that it was almost impossible to turn them out.

That the Senate Committee was also out to learn about possible personal interest in the placing of contracts is revealed by the frequent question into the value of the Delco ignition system in which Col. E. A. Deeds was interested. Senator Frelinghuysen inquired of George H. Mueller of the Curtiss Corp. if the Delco ignition system could be improved upon. Mueller replied that he did not believe so. Senator Chamberlain asked Charles M. Manly, Curtiss engineer, what his opinion of the Delco system was, and was told that he approved of it. Senator Reed, who displayed the keenest interest in this matter, asked O. E. Hunt of the Packard Motor Car Co. what ignition he used on the Packard airplane engine and was told the Delco. He asked Mr. Hunt if he regarded the Delco as the best ignition system

(*Continued on page* 739)

Tractor Activities in the Twin Cities

Tractors in All Sizes and in Many Types Being Built in Minneapolis—Number of Manufacturers in the City Large, But Big Producers Are Few—What the Different Firms Are Doing

By P. M. Heldt*

MINNEAPOLIS has been a fertile field for tractor development for many years past, and the lists of tractor makers at various times have shown more than a score of manufacturers located there. The neighboring city of St. Paul has shared, to a small extent, in this development. A few of the manufacturers on the Minneapolis list have got into production on a large scale and turn out tractors by the thousands annually; several others operate on a more modest schedule and of these some have their machines manufactured for them on contract. Of the concerns listed with addresses in downtown office buildings, the majority seem to have gone out of business. Some still have a place where they receive their mail, while others have vanished entirely. Minneapolis to-day has more individual tractor factories than any other city in the country, though she may not be producing the largest number of tractors.

The Minneapolis Steel & Machinery Co. is a very large concern, and although tractor manufacture is only a small part of its business it turns out a couple of thousand machines a year. The firm manufactures four different models, with ratings ranging from 16-30 to 60-90 hp. Of course, the 16-30 is the leading model; that is, the one produced in the largest numbers. Although the firm is now 80-85 per cent on war work, it is continuing to turn out tractors in large numbers and is doing development work at the same time.

All E-B Models Burn Kerosene

Emerson-Brantingham Implement Co. also count among the largest tractor concerns in the country. They operate several tractor plants in different parts of the country, the Minneapolis plant turning out tractors of the smaller sizes. The medium-sized machines (20-35) are manufactured at Waynesboro, Pa., and the large ones (40-65) in Indiana. The present output of the Minneapolis plant is about 25 tractors per day. All of the E-B models are burning kerosene and distillate, but development work is being done on the heavy fuels problem by the company's engineers.

The "Big Bull," which has long been a prominent product on the tractor market, is being manufactured for the Bull Tractor Co. The engines for the Bull tractor are being manufactured by the Toro Motor Co., which is related to the Bull Tractor Co. through stock ownership, and the frames and other structural parts have been manufactured by the Minneapolis Steel & Machinery Co.

The Bull is a two-cylinder tractor with a 12-24-hp. rating. It has a frame of 9-lb. channel steel which is hot riveted. The engine is of the opposed type, with L-head cylinders of 5½-in. bore and 7-in. stroke. It is provided with a governor and its speed is controlled at 750 r.p.m. Lubrication is by circulating splash and ignition by magneto with an impulse starter. Kerosene is the fuel burned and a supply of 18½ gal. can be carried in the fuel tank, besides 3½ gal. of gasoline used in starting. The weight of the tractor is 4870 lb., and it is geared to operate at a plowing speed of 2.4 m.p.h. The drive is direct through spur gear and roller pinion to the bull wheel. A contracting type of clutch is used, which is lined with Thermoid asbestos fabric and acts on a flange cast on the flywheel. The belt pulley has a diameter of 12 in. and a face of 6½ in.

Is of the Three-Wheel Type

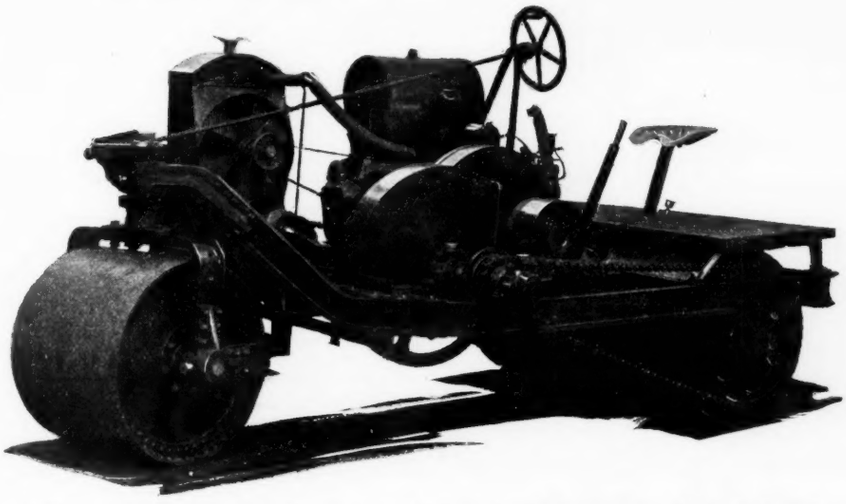
The Bull tractor is of the three-wheel type, having a large drive wheel running in the furrow, a small land wheel which also has power applied to it, and a single front steering wheel. The drive wheel is 60 in. in diameter by 14-in. face; the land wheel 40 in. in diameter by 8-in. face, and the front wheel 30 in. in diameter by 6-in. face. The frame extends around the main drive wheel. Hyatt roller bearings are used.

Recently the Bull Tractor Co. has brought out a lawn roller which is equipped with the same power plant as the Bull tractor. It has a single central front roller and two rear rollers, the three overlapping so that a space equal to the width over the two rear rollers is compacted at each passage of the machine. The rollers are made of boiler steel and are designed to be ballasted with water. When the machine is light it weighs about 5700 lb. and when filled with water the weight is about 7700 lb. The drive is from the engine crankshaft through the clutch and a spur-gear reduction to the jackshaft and thence by chains to sprocket wheels secured to the outer ends of the two rear rollers. There is thus a double chain drive to the two rollers which are mounted rigidly on the axle, and in order that each chain may take an equal amount of driving effort a

*P. M. Heldt has been making an extensive investigation of farm tractor manufacturing conditions throughout the Middle West.

frictional equalizing device is incorporated in the jackshaft which slips if one of the chains transmits all of the power, but holds if the power is equally divided between the two chains. Steering is effected in the same way as on the Bull tractor, viz., through a worm and worm-gear sector, and the backward thrust on the forward roller is taken through a horizontal yoke spanning it on a small thrust roller mounted on the frame.

This roller is intended for use on golf links and parks, on large estates, etc., and it is believed that it will also prove useful as a road roller. The first machine was built to the order of the Minneapolis Golf Club, of which the officials of the Bull Tractor Co. are members.



This power roller has the same engine as the Bull tractor. It is designed for use on golf courses, in parks and on large estates, and may be used also for road rolling

The Nilson Tractor Co. began operations in 1914 and has turned out to date a little over 1000 machines. It is now producing two models, known as the Nilson Senior and the Nilson Junior respectively. Both are equipped with Waukesha four-cylinder engines, the Senior having the 4¾ x 6¾ size and the Junior the 4¼ x 5¾-in. size. One of the features of the Nilson tractor is the triple drive wheel, and another the patented lever hitch, by which some of the weight normally carried on the front wheel is transferred to the rear wheels when the tractor is pulling a load, so as to increase the traction which it is possible to obtain without slippage of the driving wheels. Either gasoline or kerosene equipment is furnished. The fuel capacity is 28 gal. on the Senior and 18 gal. on the Junior. Ignition is by K-W high-tension magneto with impulse starter. Both engines are governor-controlled, the governor speed being 800 r.p.m. in the Senior and 1000 r.p.m. in the Junior.

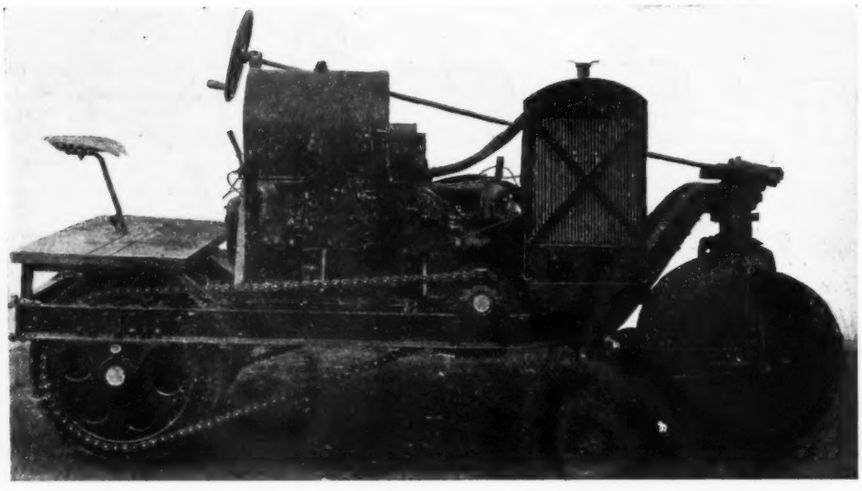
The transmission has a three-point support and gives two forward speeds and one reverse. Hyatt roller bearings are used throughout. Three different gear reductions can be obtained by using sprocket pinions of 10, 11 and 12 teeth respectively. With an 11-tooth pinion the speed range is 2½ to 5 m.p.h. for both models. There is a double-chain drive to sprockets between the outer and the central driving wheels. Shock-absorbing and equalizing devices are embodied in the rear-drive sprockets. The frame of the Senior is made of 6-in. channel steel and that of the Junior of 5-in. Both frames are mounted on half-elliptic springs with adjustment and equalizing features. The Senior complete with its side wheels weighs about 6200 lb., while the weight of the Junior is 5000 lb. Owing to the use of the three driving wheels the weight per unit of ground contact area is low and the tractor should be able to operate on very soft ground.

Beeman garden tractor doing field work. This machine is much used in truck farming

The Gray Tractor Co. continue to manufacture their drum type of tractor, for which they have had a very good sale. Gasoline equipment is furnished regularly with this tractor, but where the customer desires to use kerosene a Bennett carbureter is fitted. During the past year quite a number of Gray tractors have been exported, the majority of them to France and Switzerland. Some also were sold to the U. S. Aircraft Production Board and the Engineers Department, undoubtedly for use in construction work.

A tractor of a rather unusual type is manufactured by the Beeman Garden Tractor Co. It is designed more particularly for use by truck farmers, and is essentially a one-horse motor cultivator and an all-purpose portable power plant. The machine is claimed to operate successfully any implement which is ordinarily drawn by one horse, and as a portable engine it delivers 4 hp. at the belt. Being a small outfit and therefore appealing particularly to farmers working small places, it is no wonder that the machine has a large sale in the East, and the writer was told that the New York agent alone placed an order for a thousand of these machines for the coming year.

The C. O. D. Tractor Co., which maintains a salesroom in Minneapolis, sells about 200 tractors a year. The machine, which is of three-plow size, is manufactured for them in St. Paul. It is equipped with a two-cylinder opposed engine of 6½-in. bore by 7-in. stroke, and is characterized by unusually large rear driving wheels (70 in.). A leather-faced cone clutch is used, and the transmission to the driving wheels is by two pairs of spur pinions and wheels. The frame is built up of 6-in. 10½-lb. channel steel and is strongly braced. The driving axle is 3 in. in diameter and made of cold-



Right side view of Bull lawn roller, which is designed to be operated with water ballast

rolled steel. It is mounted in white metal bearings. As stated, the reduction from the engine crankshaft to the rear axle is obtained in two steps, the first being through a set of spur gears with a face of 2½ in., and the second through the bull gear and pinion of 4-in. width of face. The countershaft gear has a diameter of 36 in. and the bull gear of 48 in., these very large gears permitting of obtaining the large reduction required on account of the high driving wheels in two steps. The radiator is mounted so its plane is parallel to the longitudinal axis of the tractor and is driven from the engine crankshaft through two belts and a pair of intermediate pulleys. The entire front axle swings in steering, and is operated through a worm and worm-gear sector. The weight of the C. O. D. tractor is approximately 6400 lb. It is rated at 13 hp. at the drawbar and 25 hp. at the belt.

The Short Turn Tractor Co., which was formerly located in the Globe Building, Minneapolis, has secured a plant in Bemidji in the northern part of the state.

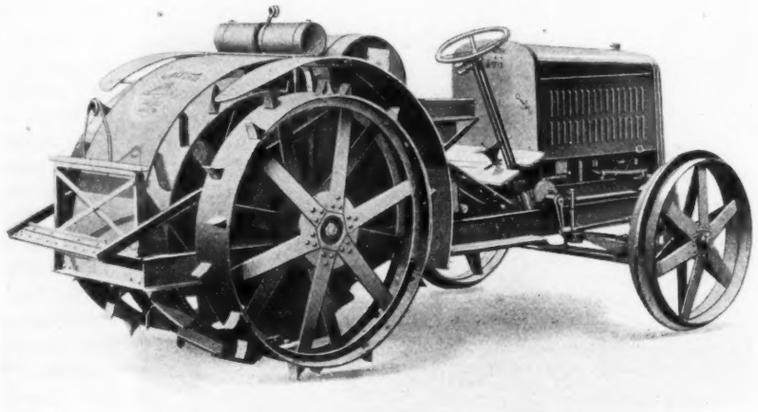
A plant that is devoted almost exclusively to tractor work is that of the Imperial Machine Co., 1611 Central Avenue, Minneapolis. The Imperial company manufactures for its own account a heavy tractor known as the Imperial 40. This machine is built on order only and five of them were turned out during the past year.

It is equipped with a four-cylinder 7½ x 9-in. engine which is said to develop 70 hp. on the belt and 40 hp. on the drawbar at an engine speed of 400 r.p.m. While the engine is of the four-cylinder type, the cylinders are arranged horizontally in two opposite sets. The radiator is of the company's own design and construction, and consists of vertical brass tubes extending between upper and lower tanks. It is mounted with its plane parallel to the longitudinal axis of the tractor. The total capacity of the cooling system is 40 gal. An internal expanding sector type of clutch is fitted. The transmission gives two forward speeds, viz., 1½ and 2¼ m.p.h., and one reverse speed equal to the low forward speed. The regular drive wheels are 8 ft. in diameter with 24-in. face, but if desired, extra wide drive wheels with 36-in. face can be furnished. The forward wheels are 5 ft. in diameter with 15-in. face. The whole front axle is pivoted at its center on a vertical axis around which it turns in steering. An all-spur drive is used, with bull wheels on the two rear driving wheels. Gasoline is used as fuel and a supply of 70 gal. can be carried. The tractor has a shipping weight of 21,000 lb. and should be capable of hauling at least ten bottoms.

Located at the same address as the Imperial Machine Co. is the Stinson Tractor Co. The latter concern during the past year turned out about 100 of its 18-36 Stinson tractors, which so far have been manufactured on order. The Stinson company has, however, purchased the equipment of a machine shop that has been doing some of its work in the past and will probably, before long, manufacture its own tractor.

The Stinson is an assembled machine employing a four-cylinder Beaver engine of 4¾-in. bore by 6-in. stroke. It is of the three-wheeled type, having a single forward steering wheel which runs in the furrow when plowing. Most of the weight is supported on a cast frame secured to the rear axle. This frame connects to the goose neck of the steering wheel by a pair of steel tubes. A dust separator of the company's own design is fitted, in which the air for the engine is drawn through water. Ignition is by Dixie high-tension magneto with impulse starter, and the carbureter is a Kingston. Transmission is by a spur pinion and intermediate gear and thence by a bull pinion and bull gear, the latter of 4½-in. face. The intermediate gear and its pinion are cut gears and have a 3-in. face. Two speeds are obtained, viz., 2 and 3½ m.p.h.

The driving wheels are 60 in. in diameter by 12-in. face and are fitted with 18-in. angle-iron lugs. The front wheel is 36 in. in diameter by 8-in. width of face. Kerosene is used for fuel, and a supply of 22 gal. can be carried in the fuel tank, in addition to 3 gal. of gasoline for starting. The capacity of the radiator is 10 gal. The foot brake operates on the intermediate gear shaft



The Wilson Senior, showing its characteristic features, such as three rear drive wheels and lever hitch

and is of the band type with Raybestos lining. The weight of the tractor ready for shipping is 6350 lb. This is a four-plow tractor.

Formerly the Simplex Tractor Company had an office in the plant of the Imperial Machine Co. and during 1916 it had built 50 tractors on order by the latter concern. No more Simplex tractors have been made, however, and the writer was told that the manager of the Simplex company, G. A. Tudhope, had gone East.

The Common Sense Gas Tractor Co. manufactures a three-wheeled tractor having automobile lines. It has an eight-cylinder Herschell-Spillman engine mounted on the frame in front under an automobile type bonnet, and the driver's seat is arranged back of the engine space and ahead of the single rear wheel. Last year's production of this tractor was given as 50 and next year's schedule had not been fully decided yet at the time of the writer's call. The drive from the engine crankshaft is through an expanding clutch and a pair of bevel gears to a countershaft carrying the pinions for the two forward speeds. These are adapted to mesh with spur gears on another countershaft, whence the power is carried through two roller chains to the single rear wheel. Contrary to conventional practice, the gears of the transmission are arranged slidably, and in order that the load may be equally divided between the two driving chains the driving pinions are clamped on the shaft between friction disks and will yield if one of the chains takes the whole load or nearly the whole load. Hyatt roller bearings are used in the transmission, with ball bearings for end thrust.

An advantage is claimed for having the driver's seat close to the motor, as it will enable the driver to more readily detect and locate faults in the engine. The two forward speeds are 2½ and 3½ m.p.h. at a motor speed of 1200 r.p.m., for which the governor is set. The belt pulley, which is 20 in. in diameter by 3-in. face, is mounted on the lower transmission shaft and is used with the gears in neutral. It turns at one-third the speed of the crankshaft. The rear axle is a live axle revolving with the large driving drum, and is 3 3/16 in. in diameter. This axle is mounted in babbitt bearings on the frame.

Has Two Drawbars

The front wheels are 36 in. in diameter with 6-in. face and the main drive wheel is 62 in. in diameter and has a 24-in. face. This wheel is made of 7/16-in. boiler steel, welded and equipped with 54 spade lugs measuring 4½ x 2¾ in. of the base by 5 in. in height. There are two drawbars, one directly under and about 6 in. below the frame and the other at the top of the frame. Each is made of 3 x 3½ x ½-in. angle iron and has ⅞-in. holes drilled along it so that implements can be attached to it. The Common Sense tractor has a wheelbase of 9 ft. and weighs 6000 lb.

One of the oldest firms in the tractor industry is the Kinnard & Sons Mfg. Co., which has been manufacturing farm tractors continuously since 1898. The firm was formerly known as the Kinnard & Haines Mfg. Co., but was reorganized under the new name a little over a year ago. The Flour City tractor, as the product of this company is known, is made in five sizes, rated respectively at 40-70, 30-50, 20-35, 15-25 and 12-20 hp. During the coming year a new model will replace the last two in the list, combining some of the features of both of them. The Kinnard firm manufactures practically all of the parts going into its tractors in its own plant. The smallest model of the line, the Flour City Junior, has a two-cylinder vertical engine, while all the others are equipped with four-cylinder engines. Kerosene is used for fuel in all models.

St. Paul at the present time boasts only of a single tractor plant, that of the Belt-Rail Tractor Co., which firm is as yet comparatively new in the industry. The Belt-Rail tractor is of the creeper type, having a single wide creeper tread at the rear and two steering wheels at the front. A peculiarity of the creeper construction is that the teeth of the driving wheel engage with extensions of the creeper shoe or link, instead of with the pins of the creeper tread, as is more usually the case. A full technical description of this tractor, which has been manufactured in moderate numbers so far, appeared in a recent issue of AUTOMOTIVE INDUSTRIES.

Another tractor formerly made at St. Paul was that of the Hackney Mfg. Co. This concern began the manufacture of tractors in 1908 and has turned out about 600 up to date. Early this year it had a fire in its plant, which proved quite a setback, and in view of the situation in the materials and labor markets, the company decided to suspend the manufacture of tractors for the duration of the war. This decision was reached after two new models had been completed, one a 3000-lb. tractor with high ground clearance for cultivating and similar light work, and the other an 8000-lb. standard tractor. While not manufacturing any tractors for the present, the company maintains a stock of repair parts for tractors it has put out in the past.

Another one of the pioneers in the tractor industry of the Twin Cities was the Andrews Tractor Co., which formerly put out a tractor having a number of unconventional features. It was a three-wheeled affair with a single drum-type driving wheel in the rear. The machine had a 2 cycle, air-cooled motor, friction transmission, and three wheels. All of these features have been more or less unpopular of late, and owing to the distrust of the farmer of the air-cooling and friction drive principles, Mr. Andrews decided to abandon the manufacture of the machine. He is now engaged in the manufacture of tractor conversion units for Fords and other passenger cars. One of the conversion units for Fords is known as the American Ford-A-Tractor and the other as the Handy Hank. A conversion unit is also being made at the Andrews plant for larger passenger cars than the Ford, to the order of the Big Auto Tractor Co. Converters of this kind have been applied to the Winton Glide, Buick, Packard, White, Hudson, Locomobile, Stearns, Case and other large cars, and convert these into four-plow tractors. Another conversion unit is made for motor trucks and permits these latter to be used for both trucking and tractor purposes by the simple interchange of the front rims and rear wheels. To transform the Twin T from a truck to a tractor the demountable rim tires of the front wheels are replaced with tractor tires, and the rubber-tired rear wheels are replaced with steel tractor wheels. It is claimed that the change can be made in less than half an hour.

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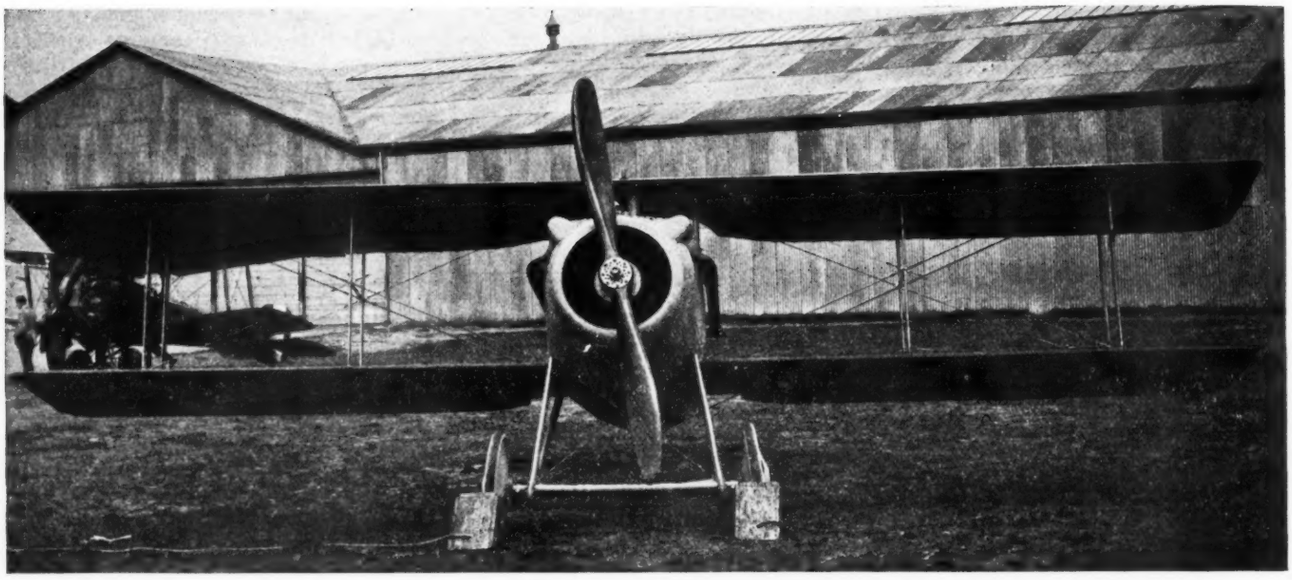
AN extensive motor bus service is to be started in Tokio by Dec. 1 for both freight and passenger traffic. Eventually the service will be maintained by 180 passenger cars, each carrying 16 persons, and by 50 motor trucks for freight. The passenger fare will be 4½ cents with an extra half cent for transfers if needed. The route of the motor bus system will follow the principal street car lines of the capital of Japan. The company announces it is planning to buy the initial fleet of motor buses from American manufacturers by Oct. 1. Later the company will build its own buses at Tokio. The building of automobile bodies is carried on quite successfully in Japan, although the importation of practically all chassis used has been compulsory.

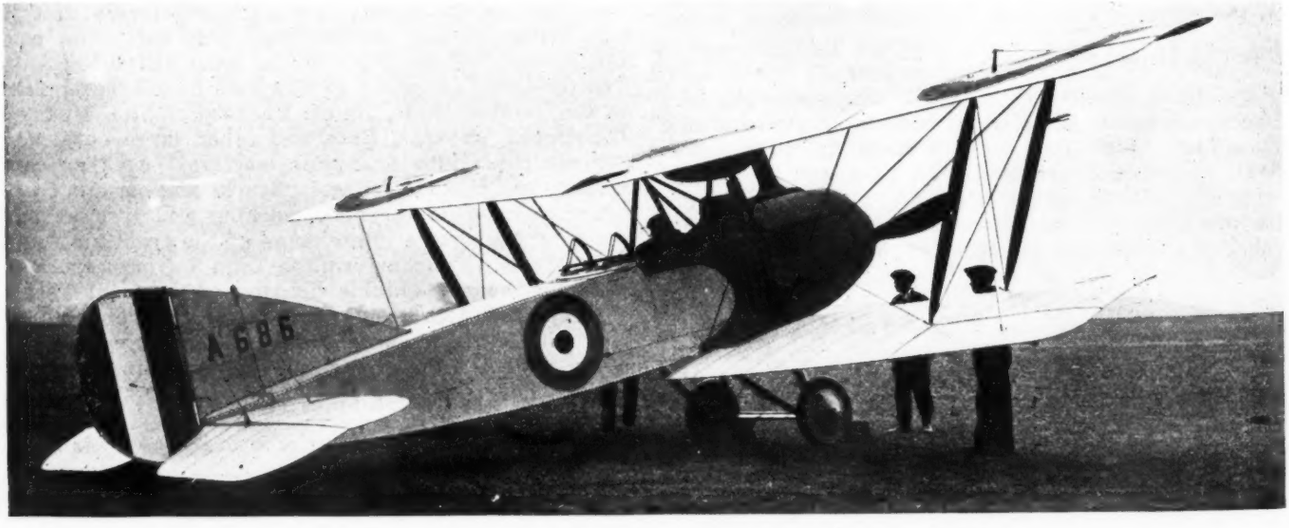
Some Recent Types of



Spad Single-Seater Tractor Scout

Engine	200 hp. Hispano-Suiza
Armament	1 Vickers gun
Interrupter gear	Spad
Number of rounds carried	450
Total weight	1632 lb.
Endurance at 10,000 ft., including climb	2½ hr.
Ceiling	17 500 ft.
Speed, ground level	122 m.p.h.
Speed, 10,000 ft.	115 m.p.h.
Climb to 10,000 ft.	12 min. 30 sec.
Span	25 ft. 8 in.
Overall length	20 ft. 3½ in.
Height	7 ft. 2½ in.
Designer	Société d'Aviation et ses Derives
Approximate date of manufacture of first machine	December, 1916

This is a French machine but is largely used by the British Royal Flying Corps, and is built under license by several firms in England.



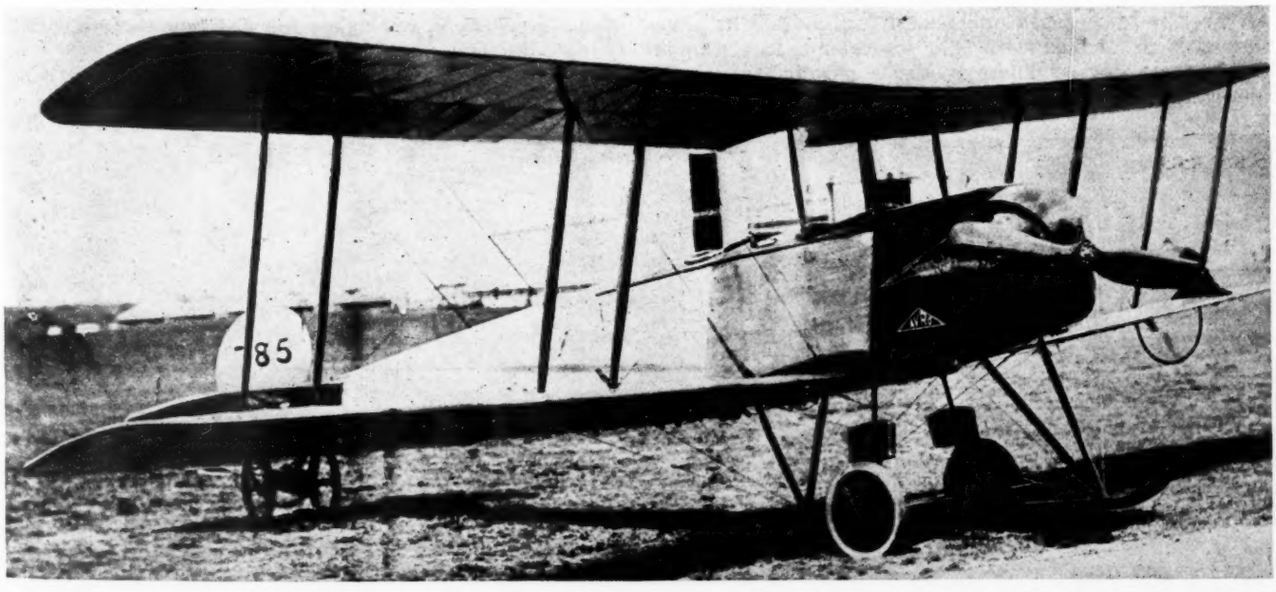
Vickers F B-14, Long-Distance Reconnaissance Tractor Biplane

Number of seats	Two
Engine	120 hp. Beardmore
Armament	1 Vickers, 1 Lewis gun
Interrupter gear	Vickers
Total weight	2672 lb.
Endurance at 10,000 ft., including climb	3¾ hrs.
Ceiling	10,000 ft.
Speed, ground level	89 m.p.h.
Speed, 10,000 ft.	84 m.p.h.
Climb to 10,000 ft.	40 min. 30 sec.
Span	39 ft. 6 in.
Overall length	28 ft. 4 in.
Height	10 ft. 9½ in.
Designer	Vickers, Sons & Maxim
Approximate date of manufacture of first machine	June, 1916

Allied Military Planes

Sopwith "Hippo" Two-Seater Fighter

Engine	225 hp. Clerget
Armament	1 Vickers, 1 Lewis gun
Interrupter gear	Kauper
Number of rounds carried	Vickers 500, Lewis 8 double drums
Total weight	2590 lb.
Endurance at 10,000 ft., including climb	3 hr.
Ceiling	17,000 ft.
Speed, ground level	119 m.p.h.
Speed, 10,000 ft	115 m.p.h.
Climb to 10,000 ft	13.4 min.
Span	29 ft. 6 in.
Overall length	32 ft. 4 in.
Height	10 ft. 5 in.
Designer	Sopwith Aircraft Co.
Approximate date of manufacture of first machine	March, 1918



Avro Training Machine

Number of seats	Two
Engine	100 hp. Monosoupape
Total weight	2100 lb.
Endurance at 10,000 ft., including climb	3½ hr.
Ceiling	14,500 ft.
Speed, ground level	89 m.p.h.
Speed, 10,000 ft	80 m.p.h.
Climb to 10,000 ft	18 min. 50 sec.
Span	36 ft. 0 in.
Overall length	26 ft. 2 in.
Height	10 ft. 0 in.
Designer	A. V. Roe & Co.
Approximate date of manufacture of first machine	September, 1914

This is the principal training machine now used in the British Royal Air Force. All machines are fitted with dual control.

South Africa Has Gasoline Shortage

Price Is $1.30 Per Gallon—Taxis Idle—Fuel to Be Rationed—Willard Station Opened—Body Building Begun—Starts Rubber Industry

By M. Edward

JOHANNESBURG, SOUTH AFRICA, Aug. 14—Johannesburg and South Africa in general were just getting accustomed to a shortage of automobiles caused by a reduction in shipping facilities when a new scare occurred, namely, that of a serious gasoline shortage. This is the second one in 9 months. As a result, the government has decided upon the rationing of gasoline and has organized a committee for this work. The necessity for rationing has existed for some time. The price of gasoline to-day is $1.30 per imperial gallon, if one is fortunate enough to obtain it at all. New supplies are not expected before the end of October, and it is now only the beginning of August. At present there are a few sailing vessels on the way with cargoes of gasoline, so that soon the stores of oil companies which are now empty will be fairly well stocked. At present 50 per cent of the taxi drivers in Johannesburg are out of work because of a lack of gasoline. It is expected that the use of taxis will soon be limited to essential requirements, and that the public will not tolerate their use for such purposes as attending races and joy riding.

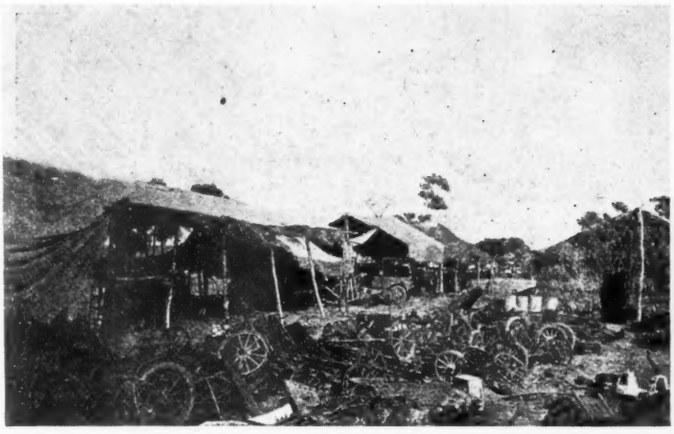
Garages are reserving the gasoline for their customers, and in some cases only supplying those who they know need it for business. The joy-rider is looked upon sternly these days. There is also a paraffin famine in full swing, a case of 8 gal. being unobtainable at a time, and charged for at, in some instances, $5 a tin, which is real profiteering, as the Government has fixed the price at $2.50. But as is often the way when prices in commodities are fixed, things become almost unobtainable, and anyway it is not much good trying to run one's car on paraffin that is almost the same price as gasoline.

This shortage has only just set in and falling off of motor traffic in South African cities is not yet noticeable. Most people have a little gas stored away somewhere in preparation for the famine that has threatened so often.

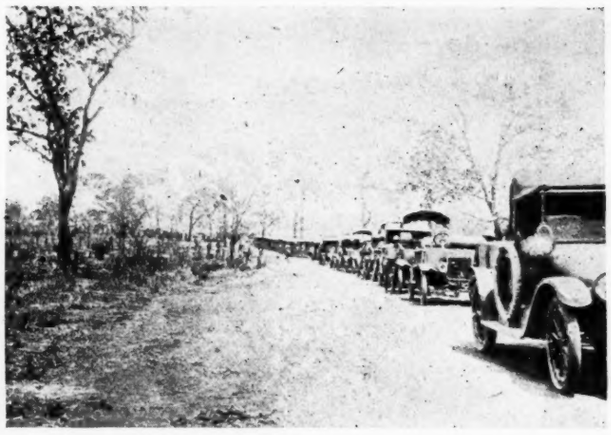
The motorcycle has always been a rival of the automobile in South Africa, owing to the high price of the latter. Although a motorcycle and sidecar of the Harley-Davidson and the Indian type costs around $750, this price is low compared with even that of the Ford at much over $1000.

Now that gasoline is scarce and high priced, motorcycles are still more favored by people who want a fast means of getting about for business—although with the few new cars that have come into the Union in the last few months it is impossible to gage the real effect of motorcycles on car sales, for nearly all new cars up to date are sold, and in most instances further shipments are being awaited to fill actual orders. Still the motorcycle will be a rival to the automobile so long as

A group of trailers contracted for and designed by the General Garage and built by Wevell Bros. for the South African Railroads. The building is the new home of the South African General Electric Co.

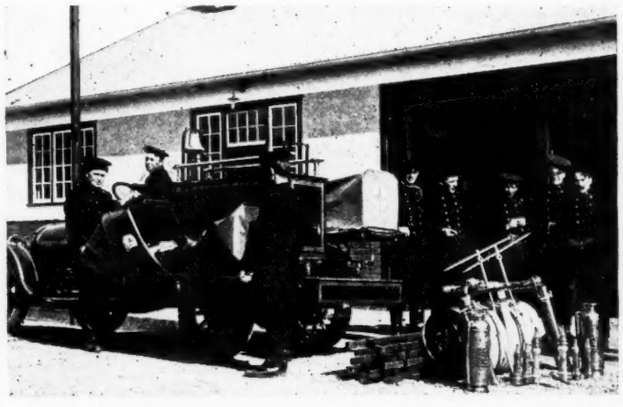


Motor debris in an East African camp lately occupied by the Germans and used for repair purposes

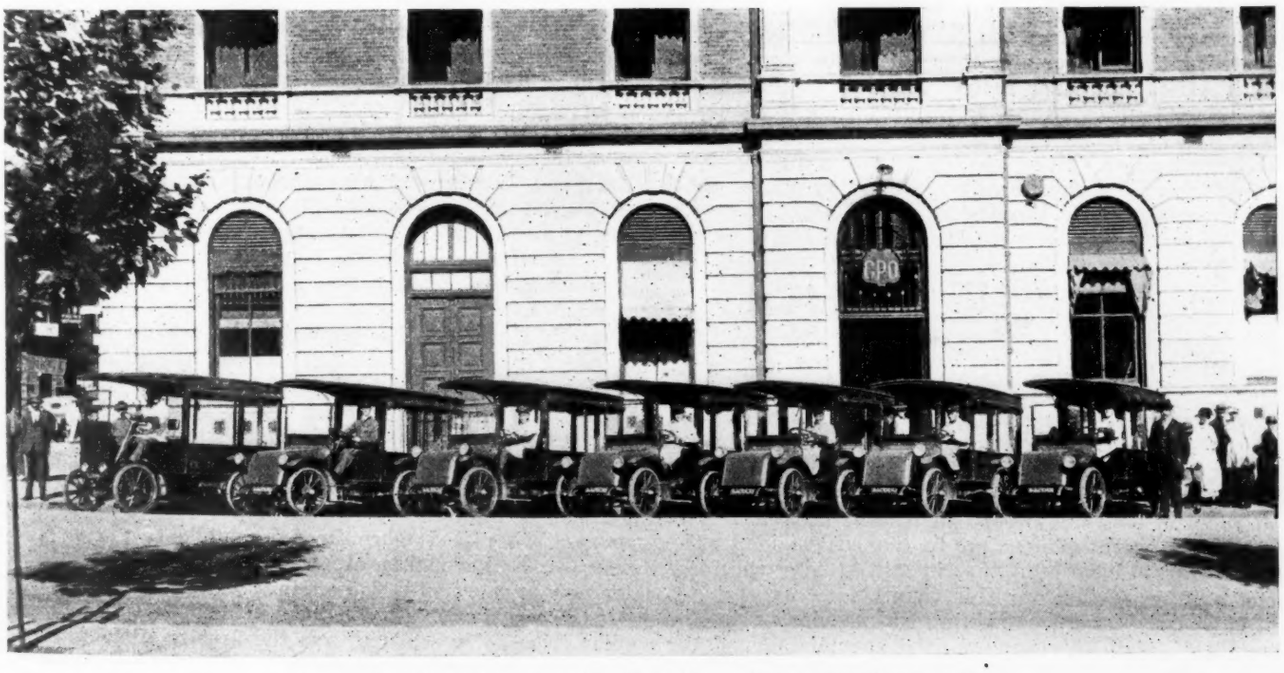


Mixed convoy in German East Africa. Some roads are excellent

Roodepoort Municipality has a real fire engine. The body was built by Wevell Bros., Johannesburg



The fire engine is convertible into an ambulance and is an excellent example of South African body building



Seven electric vehicles used by the Johannesburg general post office

An example of local body building; an ambulance built on a Reo Six chassis

One of the small body building firms which have started in many of the big towns in South Africa

A Ford camp in late German East Africa

British transport trucks burned by the enemy

the present high petrol and car prices continue. It is surprising the number of motorcycles to be seen all over South Africa and other British colonies, and one of the first things that a visitor to the United States of America notices is the almost complete absence of motorcycles in the largest cities.

There is not much difficulty in obtaining spares, most agents having fairly large stocks on hand. Tires are also obtainable in most sizes, but, as is only natural, are steadily increasing in price. An 8 x 5 x 105 tire now costs about $50, as against $40 six months ago.

All the 1918 model cars have been seen now. The 1918 Hupp being the latest arrival and having most changed in construction, it is perhaps just as well to mention it from a South African point of view first. When it arrived it was so unlike what we think of as a Hupp that it took some time to get owners' opinions. Well, it is going to be just as popular as ever. The fact of less weight with more power is a selling feature in the country districts, where there had been a feeling that Hupps were going a bit to the heavy side. The manufacturers have been wise in still keeping the magneto, a Hupp feature for this country.

Studebaker cars are gaining in popularity in the country districts—a result of good advertising and the goods being up to it. The Johannesburg Motor Mart, the agents, have had a stiff fight to bring this car back to its former popularity. It takes a long time to overcome any prejudice in the mind of the farmer.

The Chevrolet agency has not been placed yet, and none of the 1918 Colonial models has come to South Africa. A few 1917 models that arrived after the agency went in have been sold recently, mostly in Cape Town. Everybody appears to have forgotten about the much advertised and over-boomed Chevrolet, whose failure was due more to this overbooming than car defects, the chief of which appeared to be too much power. South Africa will find out the best and worst in any automobile made.

Another car that has proved itself useless for country work is the Scripps-Booth. As can be well imagined, its daintiness does not lend itself to the hard work to be found on any South African road; but Wevell Bros., who run this car, do not advertise it for country use, and it is fairly popular in the towns, especially as a lady's car.

The Reo has won the respect of all. Saker's Garage, agents, has placed more Reos in public service works than three other makes, excepting electric vehicles. Reos are now to be seen as fire engines and ambulances. The Roodepoort Municipality, a town of 8000 inhabitants, 14 miles from Johannesburg, was the first to try out a fire engine built on a Reo six chassis. This month two Reo ambulances went into the Johannesburg municipal serv-

ice. Reos are snapped up by the municipalities almost as fast as they arrive. The 1918 Reo is a little heavy to appeal to the farmer.

One thing this great war has done. It has made South Africa more self-reliant. Spares and bodies that were deemed impossible to manufacture four years ago are now being made by several firms manufacturing exclusively.

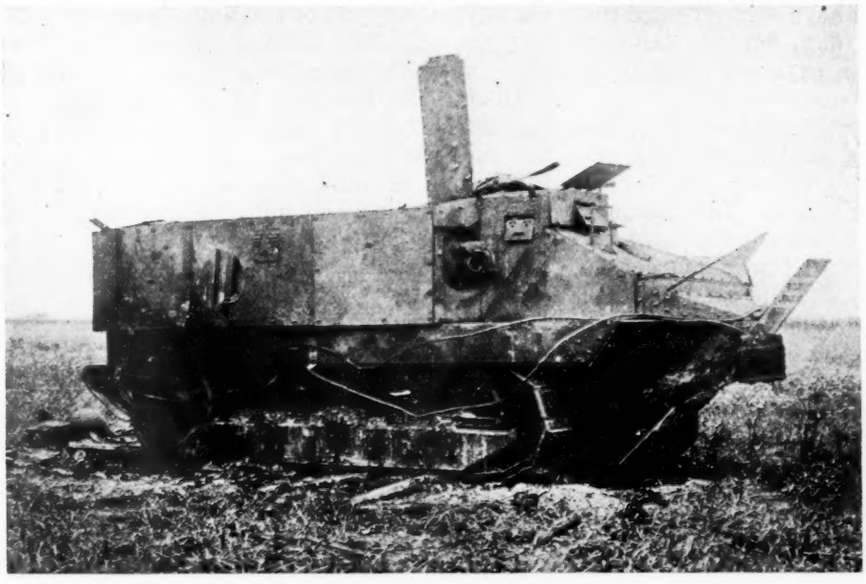
The South African Rubber Mfg. Co. is turning out such things as rubber motor mats and retreading and vulcanizing tires. They might make tires soon, but this can in no way affect the importation of tires for a long while.

A Willard battery service station has been opened in Johannesburg. This is the first service station of its kind in South Africa, and it fills a want. All car owners who use batteries are requested to employ the service.

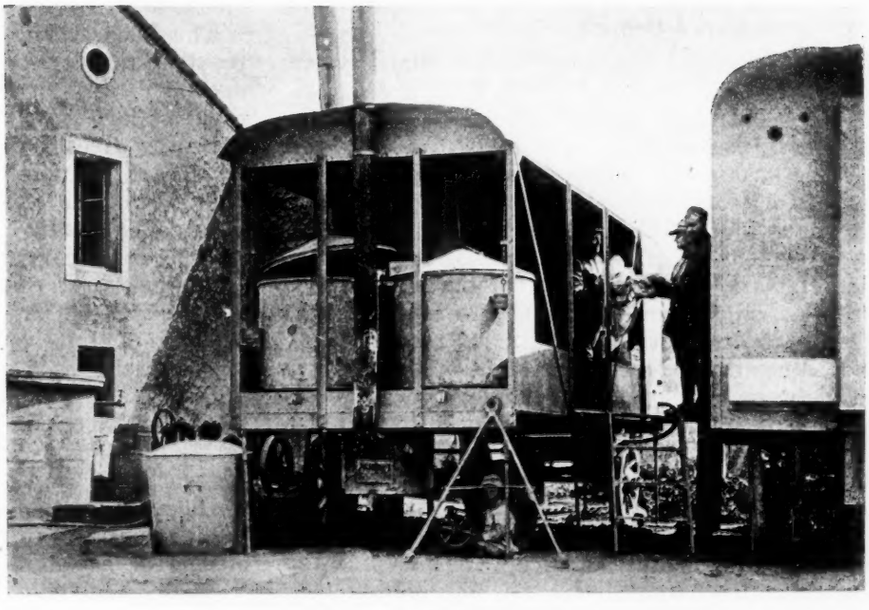
The word "service" is getting to mean something here now. Nothing succeeds like success, and success attending the efforts of those trying out service ideas has led to general betterment of the South African automobile business.

From a sales point of view things have not altered much yet, although most garagemen are getting anxious. Cars have been coming forward from the United States of America lately, spasmodically, it is true, but in fair quantities. It seems hard that just when salesmen are patting themselves on the back about having a few cars to sell there should be confronting them a scarcity of gasoline to run them on. It is fine to have cars that are supposed to have been wandering about the ocean for the last few months come to hand at last.

Automotive Activities at the Front



German tank of the large type which was put out of action by a direct hit from an American 75-mm. gun during a counterattack by the first division of artillery somewhere in France



This is a mobile laundry where much of the washing for soldiers is done. A number of these are in use in the various army divisions in France

Collective Bargaining Outside or Inside?

The Manufacturer Must Decide Whether He Will Bargain Collectively with a Labor Union or Collectively with an Employees' Organization

By Harry Tipper

FROM time immemorial the general method of payment for labor has been based upon a time consideration. Centuries have elapsed since the laborer's pay was a penny a day, but the daily or hourly measure as a basis for payment persists in most lines of work and involves most labor.

It is probable that with most classes of work the system will prevail which has been found most acceptable for the long period of history and for so large a section of the working public. This much is generally understood, but it it not usually appreciated in industry that for most of that same period of centuries the rate of wages and the conditions of labor have been the subject of collective action.

During most of that time the amount of wages for labor, the regulation of apprentices and other matters were the result of national legislation in Great Britain. In fact, the laws governing these matters were still on the statute books at the time of the formation of the United States, although they had by that time fallen into general disuse.

Three things came definitely out of the history of labor legislation in Great Britain, during those long centuries of growth.

Three Points from Labor History

1—The universal character of the time system of payment.

2—The control of wages and conditions of employment by legislation.

3—The strong character of the law against combinations of workers for the purpose of increasing wages or changing the conditions of employment.

It is evident from these examinations that the choice of work and the liberty of private contract were practically unknown before the beginnings of the industrial revolution in that country.

It was not till 1824 that the right of private contract between employer and employee was recognized and it was recognized then only to bring in such chaotic conditions as resulted in the formation of labor unions and an era of great disturbance in industrial life, with the general adoption by the workers of the old principle of collective decision upon wages, but operated through the new machinery of collective bargaining.

As far as it is necessary to go back in the history of the matter, collective action on wages has been the normal method of settling the matter—that is to say, the collective method has obtained through 80 per cent of the time for a majority of the workers.

During the last part of the craftsman period in the last half of the eighteenth century the legislation determining wages had fallen into disuse, so that in this period of small workshops and intimate contact between master and man the private contract system had actually grown up in the form of an individual agreement between the master craftsman and his employee.

The employer of these artisans was himself a workman, who, by his skill and capacity, had accumulated around him a number of others for the privilege of studying with him, or because of the power and comparative wealth incident upon skilful operation.

Employees Treated as Individuals

The skill of the worker was his own. It belonged to the master only as he treated the workman individually in accordance with his individual requirements.

The tools with which the workman produced a result in the days of hand labor were such that they depended for their usefulness entirely upon his skill, the unskilled being unable to do anything with them.

It was necessary, therefore, for the employer to treat each of his employees as an individual. The value of all the work was his own, the skill of his hands in executing and the skill of his brain in planning he could carry away with his bag of tools.

The industrial revolution changed the whole aspect of the matter. The whole craftsman life was based on his individual value as a worker and his individual character as a citizen. In everything which he did he stood out and measured himself and was measured by others as an individual. The table or chair, the saddle or shoe, the piece of cloth were his work and their value bespoke their quality.

He could express his individual ideals in his individual work and in that way at once satisfy his ambition for accomplishment and acquire his standing among his neighbors.

When steam power made it possible to enlarge the little shop, to multiply the speed, size and capacity of the tools and to transfer a large part of the skill from the man to the machine, there was a change from individual to collective work, a change from constructor to operator, from workmanship to tending a machine, from a broad knowledge of the skill of a trade to the narrow requirements of a specialized operation.

The individual value to the employer was lost, the individual place was lost and the workman became valuable only as he was combined in co-operative action with thousands of others similarly engaged.

There was no apparent reason for paying different wages to different men running the same type of machine; so the system of standard wages which had fallen into disuse during the latter part of the craftsman period, came again into general use and the union was born of standard wages to obtain the right amount of standard wages for a standard operation by standard methods of bargaining.

For a standard amount of time, therefore, involved in the same type of operation the standard wage has become the usual method, and while it is not subject to legislation it has been the subject of an increasing amount of collective bargaining, the workers of the one specialization getting together in order to be in a position to secure the highest standard for that operation.

Between 1800 and 1860 the right of private contract and the lack of general organization among the workers led to chaos under which the conditions of the workers in many lines of endeavor were appalling. Wages given in a competition with starvation and frequently under scandalous system of piece-work requirement, boarding the workers, payment of part of the wages in truck, long hours and unsanitary conditions of workshops are all recorded frequently as the result of the observation of competent and impartial observers.

Wage Question Always Prominent

The rapid extension of the specialized industrial system, by which the tasks are being divided constantly, and the progress in labor organization have brought the question of wages to the front in the minds of all who have the work of labor management.

Higher standards of pay have been one of the demands of labor in almost all of the disputes which have arisen between the owners of industry and the workers.

Furthermore, standards of wage have necessarily tended toward standards of performance and the standard of performance has gravitated, just as logically toward a minimum. For most persons, workers of all classes not excepted, individual recognition is necessary in order to secure the maximum of accomplishment. Consequently the general presence of standard wages with its absence of individual recognition has led to the practical limitation of output and the jealous guarding of the subdivisions of specialization created originally by the necessities of industry.

Various systems of bonus for increased accomplishment, profit sharing and other attempts to provide the individual recognition necessary for incentive have been tried by individual manufacturing concerns with varying degrees of success.

These when they are fair and just and are arranged so that they win the worker's confidence, by the manner of their presentation and the character of their enforcement, are long steps in the right direction; but for much work they are not applicable and they are against the recognized platform of the labor organization as such.

That the labor organizations are against it is logical, for these are collective bodies, which do not thrive upon the recognition of the individual but upon the subordination of the individual to the precedents and traditions of the organizations themselves.

Furthermore, they are political bodies in character, acquiring their strength from the numerical weight of memberships. Their leaders must secure their mandate from the majority of the workers and the mediocrity of the majority must govern their actions.

The labor organization, formed to protect the interests of the workers of a particular occupation, not designed to assert their rights as individuals, can offer no solution for the wage trouble.

In fact, their best efforts must be spent, continually, in the extension of the standard wage scale and the increase of the relative amount of that standard. How far they are prepared to go in this cardinal principle of their organization tenets is indicated by the demand of the Labor Party in Great Britain for a national minimum wage as guarantee of living to all workers.

Base Is Point of Interest

It is evident, however, that all the workmen engaged in the same kind of work in a factory are interested in the base upon which wages will be considered, whether that base be piece-work or time. They will continue to demand a collective hearing upon the subject, for they have a common requirement as to their work and a common ground as to their general necessities.

Unless the manufacturer is willing to accept this principle of collective bargaining, or the collective discussion of the wage problem with the workers at interest, he must face the alternative of being obliged to bargain collectively with the general body of labor in whom he is not particularly interested and who have no particular interest in his individual concerns.

It is upon this question more than any other that the council table of co-operation between individual employer and worker through some adequate and equitable system of representation is essential.

Collective bargaining is a fact, it is an increasing necessity—the question of whether the manufacturer believes in it or not is unimportant, the condition is upon us and the time for arguing upon its abstract merits and demerits is passed.

(*Continued on page* 738)

What Langley Did for the Science of Aviation

Experiments Continued with Rubber-Driven Models and Others Using Compressed Air, Carbonic Acid Gas and Electric Batteries —Steam Adopted as Source of Power

PART II

IT is safe to say that previous to the successful accomplishment of Dr. Samuel Pierpont Langley, in obtaining sustained free flight by means of steam-driven model aerodromes, no such mechanism or any type of heavier than air machine had ever sustained itself in the air for more than a few seconds. Upon the 6th of May, in 1896, Langley's Steam Aerodrome No. 5 flew for 1 min. and 30 sec., and during that time covered approximately 3300 ft., which means that it traveled at a speed between 20 and 25 miles per hour. That brief period, during which his model flew, was the result of more than 9 years of the most exhaustive research and unceasing application. Langley worked at his laboratory experiments and his field trials for nearly a full decade before he satisfied himself that he had actually been able to produce sustained mechanical flight.

In the introduction to his "Memoir on Mechanical Flight," Langley included a paragraph which can well be quoted here, in order that we may have a true conception of the state of the embryonic art at the time that Langley began his work in it.

"I desire to ask the reader's consideration of the fact that even 10 years ago [this was written in 1897] the whole subject of mechanical flight was so far from having attracted the general attention of psychists or engineers, that it was generally concluded to be a field fitted rather for the pursuits of the charlatan, than for those of the man of science. Consequently he who was bold enough to enter it, found almost none of those experimental data which are ready to hand in every recognized and reputable field of scientific labor. Let me reiterate the statement, which even now seems strange, that such disrepute attached so lately to the attempt to make a 'flying machine,' that hardly any scientific men of position had made even preliminary investigations, and that almost every experiment to be made was made for the first time To cover so vast a field as that which aerodromics is now seen to open, no life-time would have sufficed. The preliminary experiments on the primary question of equilibrium and the intimately associated problems of resistance of the sustaining surfaces, the power of the engines, the methods of their applications, the framing of the hull construction which held these, the construction of the propellers, the putting of the whole in initial motion, were all to be made, and could not be conducted with the exactness which would render them final models of accuracy."

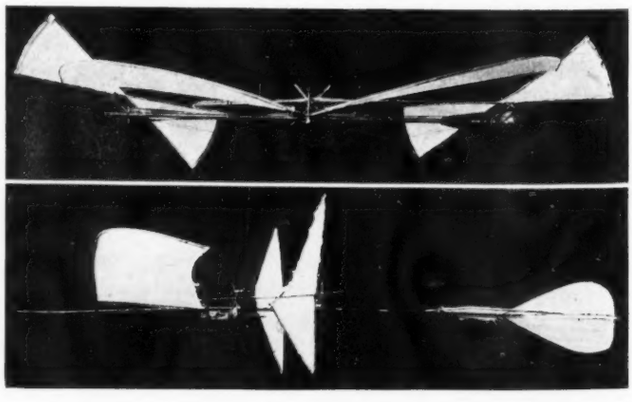
In taking up the second part of his work in aviation, Langley aims not to produce flying machines of man-carrying capacity, but rather merely to demonstrate that mechanical flight was possible, and his efforts during this period were directed to the securing within the years which he devoted to them, and which he regarded as an all-too-short space of time for the accomplishment of such an object, a demonstration of the kind which would be conclusive in the eyes of scientific men, as well as of a general public, which was, he held, nothing short of actual flying.

When his aerodrome, No. 5, built chiefly of steel and driven by a steam engine, had flown for more than half a mile, had alighted safely, and had performed a second flight on the same day, he felt that he had at last made such a great step as to provide the long-desired experimental demonstration of the possibility of mechanical flight.

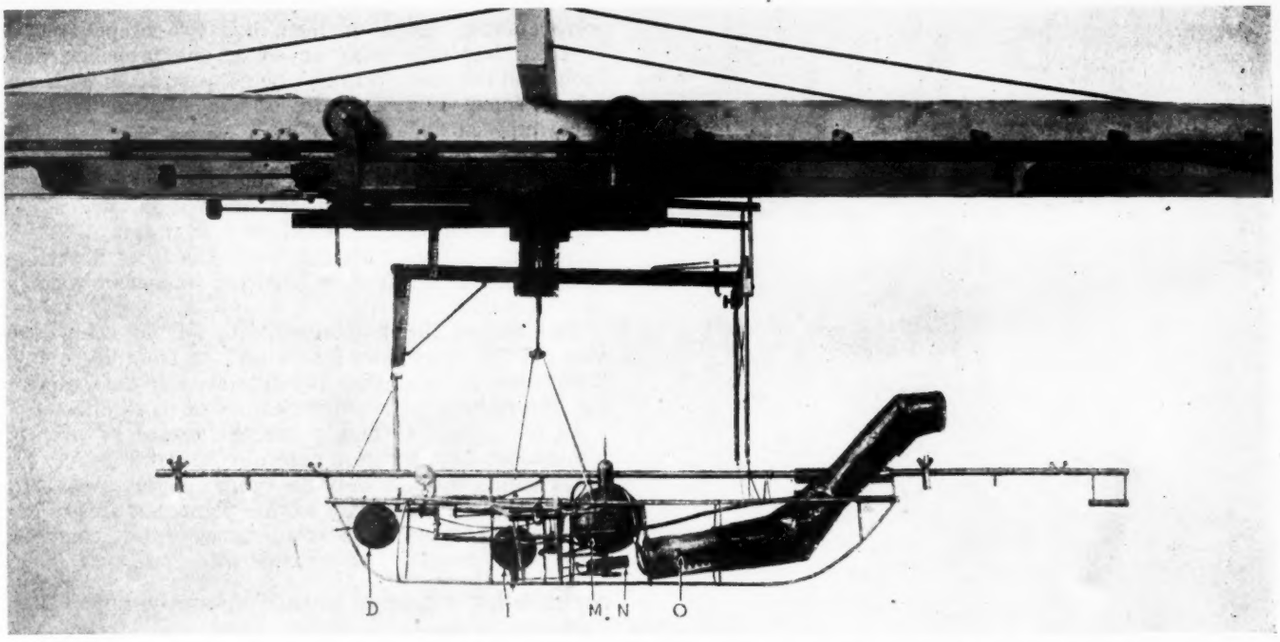
In April, 1887, Langley began his experiments with rubber-driven models, at the Alleghany Observatory. They were continued at intervals for three or four years, part of the time at the observatory, but for the most part in Washington. During this period, between 30 and 40 different models were constructed. Besides this, each one of the different models was altered a great many times, so that in reality, during the time that he was working with them, a total of something more like one hundred models were really tried out.

It will be understood that the models referred to here are those which were built before he undertook the propulsion of models by steam, and they were driven by the power developed by rubber bands untwisting or unwinding after having been twisted or wound up.

Following the experiments with the rubber-pull models came others with models driven by motors using compressed air, carbonic acid gas, and electric batteries. None of these models proved at all satisfactory, nor gave



Front and side elevations of one of the several rubber-pull aerodromes with which Langley experimented before making his steam power driven models



Side view of steel frame of aerodrome No. 5 suspended from launching car Oct. 24, 1896. This aerodrome and also No. 6 were light steam-driven models, with two pairs of main planes and two propellers located between them. The power plant as shown in this illustration consisted of D, a compressed air tank which forced the gasoline from the tank I, through the burner N, from which the flame of Bunsen type projected into the tubular boiler O. The steam generated here passed into the separator M, from the top of which it was led to the single-cylinder engine located in the center of the model. This engine was 33 cm. diameter by 70 cm. stroke, with slide valve, and weighed 464 grams. Power was transmitted to the propellers by shafting and bevels

as good results as had been obtained from the models which were rubber driven. In fact, the chief benefit derived from the rubber models was that they convinced Langley that he must seek some other source of power, which probably would be the steam engine, before he would be able to demonstrate that flight could be attained.

At the beginning of his experiments with models, it was necessary, as Langley points out in his memoirs, to determine the relationship of the center of gravity and the center of pressure. A great deal of experimentation was necessary to determine just what this relationship is. Another difficulty encountered was in finding some satisfactory method of launching his models in the air, and this difficulty increased as the models became larger.

Anticipated Present Launching Methods

"It is frequently proposed," said Langley, in his record of the experiments, "by those unfamiliar with this difficulty, to launch the aerodrome by placing it upon a platform car or upon the deck of a steamer, and running the car or boat at an increasing speed until the aerodrome, which is free to rise, is lifted by the wind of resistance. But this is quite impracticable without means to prevent premature displacement, for the large surface and flight weight renders any model of considerable size unmanageable in the least wind, such as is always present in the open air. It is, therefore, necessary in any launching apparatus that the aerodrome be held rigidly until the very moment of release, and that instance a simultaneous release from the apparatus be made at all the sustaining points at the proper moment."

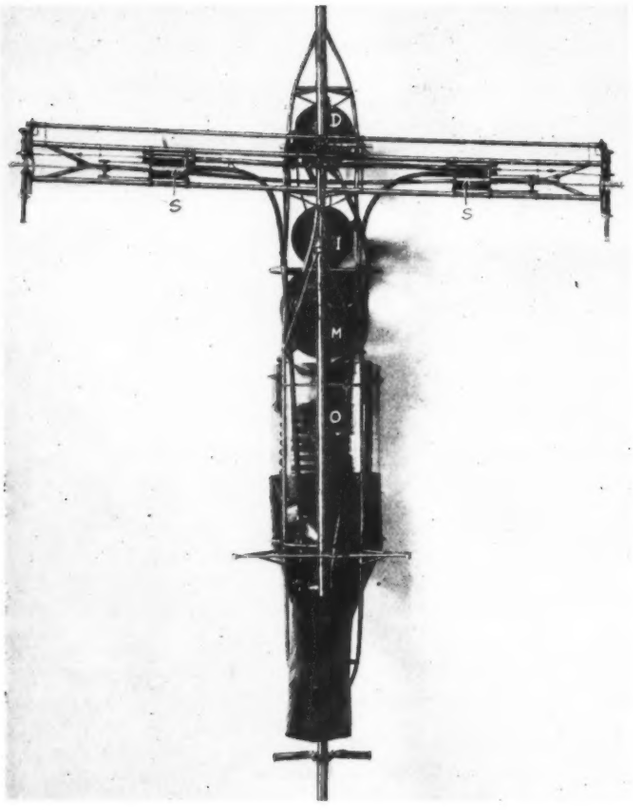
It is interesting to note that the method of launching which Langley found to be impossible at that time with his models is essentially the very manner in which aeroplanes are launched from the earth to-day, the only difference being that instead of being carried on cars, they carry their own cars with them.

The first attempt, at the beginning of his experiments with rubber-pulled models, was made with one which consisted of a frame formed by two pieces of wood, each about one meter long and four centimeters wide. For the sake of lightness they were of star-shaped section, and were braced with cross pieces. They carried two long strips of rubber, each about one millimeter thick by 30 millimeters wide and 2 meters long. These rubber strips were doubled, and weighed 300 grams. It was possible to wind each of these strips to about 300 turns. One end was made fast to the front of the frame and the other to the shaft of a four-bladed propeller having a diameter of 37 mm. Light pine frames were used for the wings, and over these frames paper was stretched. The wings were double, one being superimposed upon the other. The wings were 15 centimeters wide by 120 centimeters long, and the distance between them was 20 centimeters. They gave a total surface of little more than 3600 square centimeters, or about 4 sq. ft.

The propellers were driven in opposite directions during flight. The whole apparatus weighed about one kilogram or something like 1 lb. to each 2 ft. of sustaining surface, and this weight proved to be entirely too great for the power provided.

Whirling Table Tests

A test on the whirling table showed that the model would tend to soar at a speed of about 10 miles an hour, but its own propelling mechanism was not sufficient to sustain it in the air. The fundamental difficulty disclosed by this model and by others which followed it was that of making the model light enough and sufficiently strong to support the power required to drive it. Other difficulties encountered were, as Langley enumerated them, "the adjustment of the center of gravity to the center of pressure of the wings, the disposition of the wings themselves, the size of the propellers, the incli-



Plan of the framework of Langley's No. 6 aerodrome, which was a development of No. 5 and differed from it only in a few details. Instead of the single-cylinder engine, two engines were used, one for each propeller, mounted at S S on the outrigger. The propellers were direct driven by the crankshafts, which, however, were connected by a cross shaft so that both went at the same speed

nation and number of their blades, and a great number of other details which presented themselves from time to time."

Two other models, each with a single propeller, were constructed and ready for trial by June of 1887. One of these had an 18-in. propeller with 8 adjustable blades, and the other a 24-in. propeller with four adjustable blades. Each had two pairs of wings, which were curved and were 4 ft. 7 in. long. These models also proved too heavy in relation to their power, and neither succeeded in actually making flights.

Two years later Langley discarded the wooden frame idea and adopted instead frames made of tubes of light metal. These in turn were superseded by frames constructed from tubes, wound from paper, covered with shellac, and they proved to be the lightest and best material, in proportion to the strength provided, which had been found up to that time. The rubber strips were carried within these tubes, which of course had to be strong enough to withstand the end thrust imposed upon them when the bands were twisted up. The propellers used with the aerodromes made in this way were of the four-bladed type.

The weight and size of the models which Langley made at this time were too great to permit of their being launched by hand, and it was not until 1891 that a model light enough actually to fly was constructed.

Work with models of this kind was carried on until 1893. Usually the wings were flat. In some cases they were curved. Some of them had two propellers, some of them had only one. In some, one propeller was in front and the other behind. Some were fitted with single wings, some with two pairs of wings, some with wings superimposed.

To quote Langley again, "The advantages and also the dangers of curved wings as compared with plain ones, were shown, and the general disposition, which would secure an even balance, was ascertained, but all this was done with extreme difficulty, since the brief flights were full of anomalies, arising from the imperfect conditions of observation."

The longest flight obtained with any of these models was not for more than 6 to 8 sec., or from 80 to 100 ft. They were so brief that the obtaining of data necessary for the making of improvements was most difficult.

In his efforts to find a suitable means of propelling his models, Langley gave careful consideration and made experiments with not only the rubber motors, which drove the models, considered up to this point, but steam, which he finally adopted; gun powder, hot water, compressed air, gas, electricity and carbonic acid gas.

Stringfellow's Engine Unsatisfactory

The construction of the first steam-driven model was begun in November, 1891. Langley was forced to work without precedent or example. He was not trained in steam engineering, and when he called upon those who he thought might assist him with his problem, he found that they were unable to offer him any material assistance, as his undertaking was so new and so radically different from anything with which they were familiar.

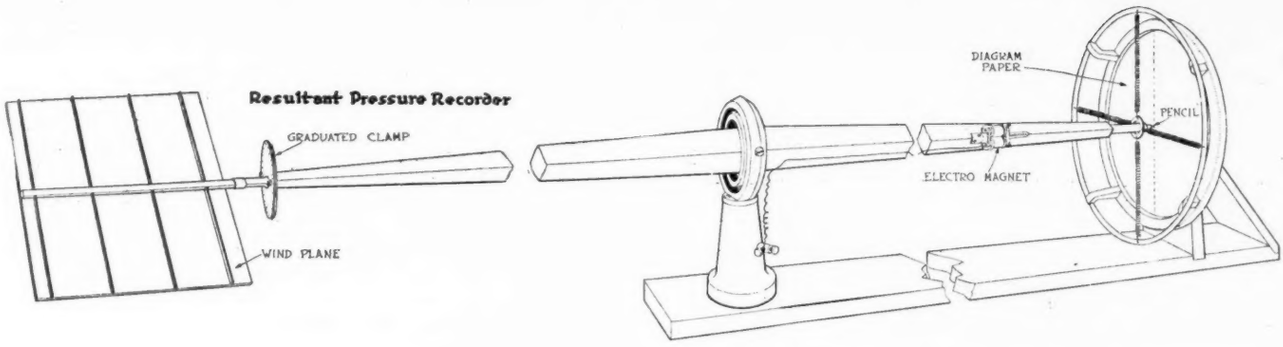
The lightest steam engine which had been developed up to that time was the Stringfellow, which had been exhibited at the Crystal Palace in London in 1868. It was capable, so it was claimed, of developing one horsepower for a total weight, including boiler and engines, of 13 lb. This engine came into the possession of the Smithsonian Institution in 1889. Investigations soon disclosed that it never had nor ever could develop the power claimed for it.

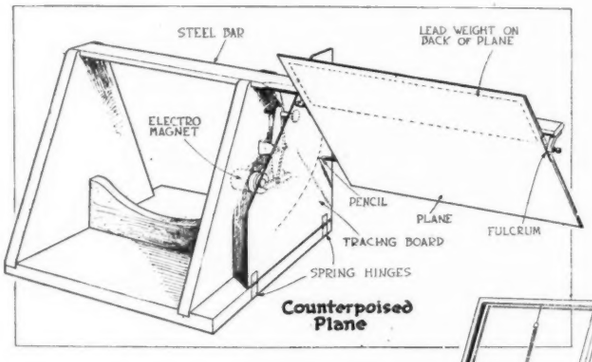
Langley had concluded from his experiments on the whirling table at the Alleghany Observatory that one horsepower was sufficient, with a plane "whose efficiency should be equal to that of a 30 x 4.8 in. plane set at an angle of 5 deg. and moving at a speed of 34 miles an hour," to propel 120 lb. He figured that with a smaller angle he could secure even better results, but concluded that the difficulties of guiding would increase as the angle diminished. He realized that no allowance had been made in the computation for the fact "that the results were obtained by means of a mechanism which forcibly maintained the supporting surfaces in the ideal condition of the best attainable angle of attack, as if in perfect equilibrium, and above all in the equally ideal condition of perfectly horizontal flight." The guide wires and the hull also contributed their share of factors to be given consideration. After taking all these things into consideration, Langley decided that one horsepower would serve to carry 30 lb. in flight, provided a supporting surface of at least 3 ft. to the pound could be obtained. Upon this basis the first steam-driven aerodrome was constructed.

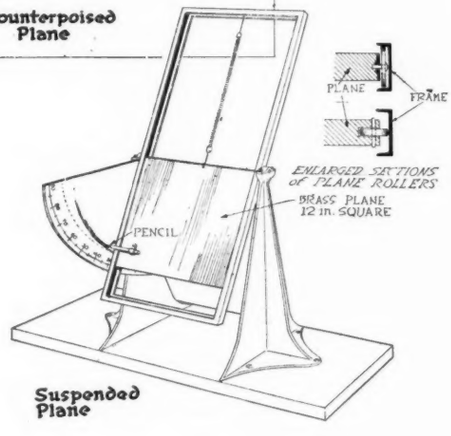
It is interesting to note that the completed model actually weighed 44 lb. and 8 ounces as against an estimated weight of 27 lb. 11 ounces.

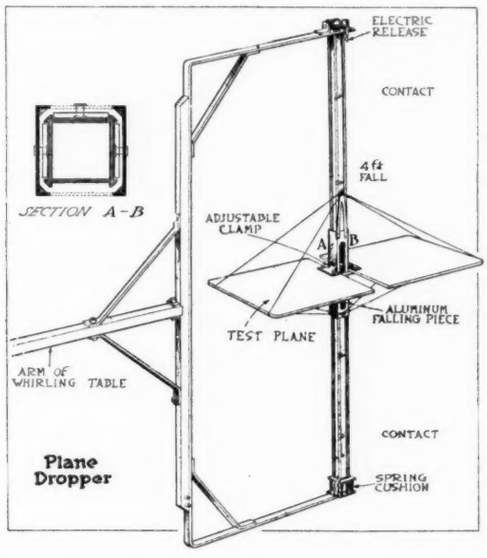
Used a Mackerel Shaped Hull

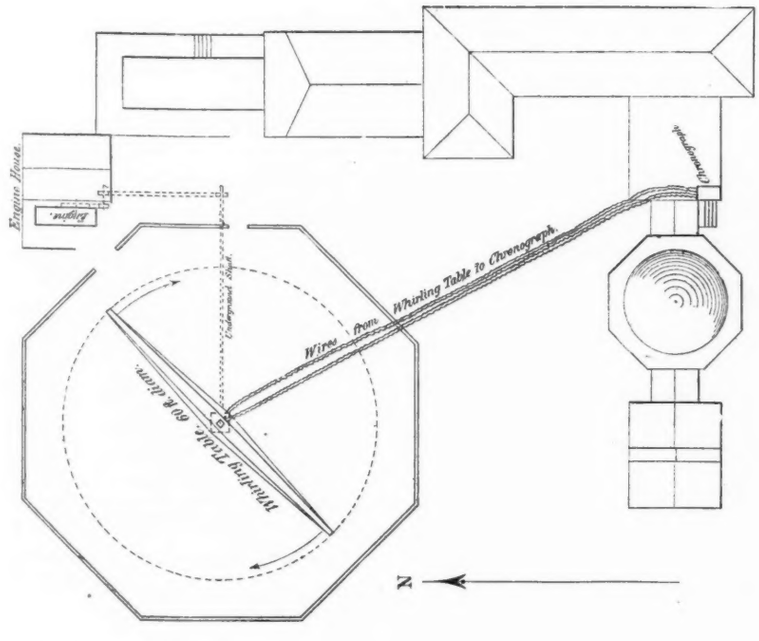
For the shape of the hull, Langley decided to adopt the lines of the mackerel as being the most advantageous from the point of view of air resistance, but structural difficulties entered into the making of the hull, and the











Instruments designed and made by Langley for the purpose of obtaining data which he used in the construction and operation of his many model airplanes. These instruments were attached in turn to the end of the whirling table shown in another of the illustrations herewith, and the various results recorded by pencil on the instruments themselves or electrically by the use of a recording chronograph

Plan of the grounds at Allcghany Observatory, showing the buildings in which Langley conducted his experiments in aeronautics, and the 60-ft. whirling table which he used for his velocity experiments with planes

lines, therefore, did not follow the plan intended, the bow and stern being of the same shape.

The construction of a suitable boiler also gave Langley a great deal of trouble. He constructed an almost endless number of them, varying more or less in type, before he secured the one with which his successful aerodromes were driven.

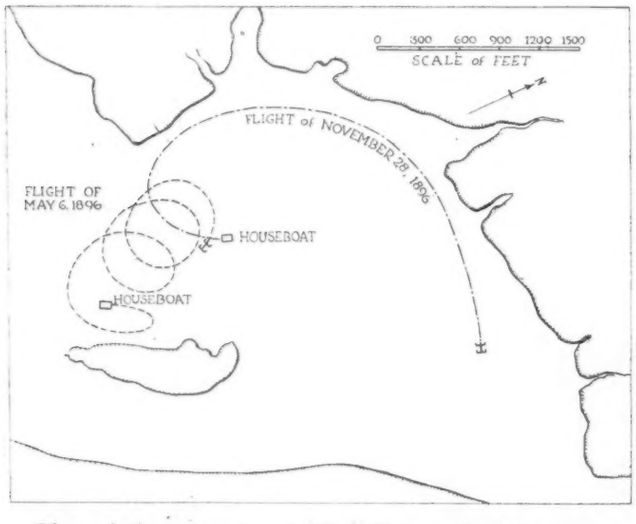
During the years 1892 and 1893 four steam-propelled aerodromes were constructed. They were known as Nos. 0, 1, 2 and 3. No. 4 was under construction by the end of March, 1893. Detailed descriptions of all these preliminary steam-driven models would be interesting, but space does not permit of giving them here. It would be well to pass them over hurriedly and to take up in greater detail the construction of Nos. 5 and 6, which were the ones whose performance satisfied Langley that he had actually obtained the results he sought.

The framework of aerodrome No. 5 was made of thin steel tubes. The main tube or midrod, as Langley called it, extended for the whole length of the machine, and carried the various attachments to which the wings were secured. A skeleton hull of steel tubing was suspended from this midrod. It was shaped somewhat like the frame of a boat, and arms ran out from the sides for carrying the propellers. The engine, aeolipile and boiler were placed within this hull. Together with the pump and separator they constituted the complete power generating portion of the model.

There were four principal parts in the aeolipile. They were the spherical air chamber which contained a supply of compressed air by means of which gasoline in the tank was forced into the burner, the tank which contained the gasoline used as fuel, the gas generator, in which liquid gasoline was converted into gas, and the burners where the fuel was burned to generate steam in the boilers.

The boiler consisted of a separator and generating coils, and was fitted with circulating pumps. The generating coils consisted of two windings of copper pipe, which had an outside diameter of 10 mm. and which were formed into 21 turns, 77 mm. in diameter on the outside. The turns were spaced 7.5 mm. apart, so that the total length of each coil was 36 cm.

The boiler was sheathed in a sheet of mica and at the front end by a strip of thin sheet iron as well. The stack was made of thin sheet iron and was slipped over the rear end.



Plan of the most successful flight of aerodrome No. 6 near Quantico, Va., on Nov. 28, 1896. The distance traveled was about three-quarters of a mile

The engine was of the slide-valve type, having a piston valve. The piston was without packing rings. The cylinder was made of steel tubing 35 mm. outside diameter and the heads were secured to flanges on the ends by means of machine screws. A thin cast-iron bushing was fitted inside of the steel tube. The bore was 33 mm., stroke 70 mm. The complete engine weighed 6.4 lb.

Bevel gears and shafts were used to transmit the power of the engine to the propellers, which were 1 mm. in diameter, and had an axial pitch of 1.25 m. They were made of white pine, in strips, 7 mm. thick, glued together. They were most carefully balanced, each blade with its mate, and each propeller with the other. They ran in opposite directions. The weight of each was 362 grams.

The photographs accompanying show the wing construction better than it can be put into words.

Aerodrome No. 6 differed from No. 5 in certain structural details, but not radically in general design. One difference was that two engines were used in No. 6 instead of one. They were located on the transverse frame, and their power was applied directly to the propellers. The cylinders of these engines were 2.8 mm. in diameter, with a stroke of 5 cm. The steel cylinders were lined with cast-iron bushings, and the pistons had cast-iron rings.

No. 6 was lighter than No. 5 and required much more careful handling and adjustment. Its flying qualities, however, were superior both as to speed and stability, when once these adjustments were correctly made.

The flying of these aerodromes was accomplished over the waters of the Potomac River. They were launched from the top of a houseboat anchored in the middle of the stream. On the roof of a house a platform was constructed, and the launching was accomplished by means of an overhead rail and suitable releasing mechanism.

The Most Successful Flight

For a description of the most successful flight of aerodrome No. 6, which was also the most successful flight accomplished by any of the Langley models, and was accomplished on Nov. 28, 1896, let us use the words of the Langley Memoir:

"The aerodrome was launched at a steam pressure of not over 100 lb., the airdraft for the burners being temporarily bad. The midrod made an angle of approximately 3 deg. from the horizontal. On account of a slight rain, which had occurred just before the machine was launched, the wings were wet and the weight of the entire aerodrome was doubtless as much as 12 kilo. Immediately on being launched the aerodrome started directly ahead in a gentle south wind, moving horizontally and slowly turning to the right and appearing to approach dangerously near to some thick woods on the west shore. However, it fortunately continued turning until it pointed directly up the beach with the wind in the rear. It then moved more rapidly forward, dipped and rose but once, and this very slightly, and continued its remarkable horizontal flight, varying not more than 2 yards out of a horizontal course, and this for only a moment, until it finally descended into the bay at a point nearly in a line between the houseboat and the railroad station at Quantico.

"Upon being recovered it was found to be absolutely uninjured, and another flight would have been made with it immediately, but the darkness had descended. The time of flight, as determined independently by two stop watches, was 1 min. and 45 sec. The number of revolutions of the propellers was 2801, or at the rate of 1600 revolutions per minute, which, with an allowance of 50 per cent slip, should have carried the aerodrome a distance

(*Continued on page* 738)

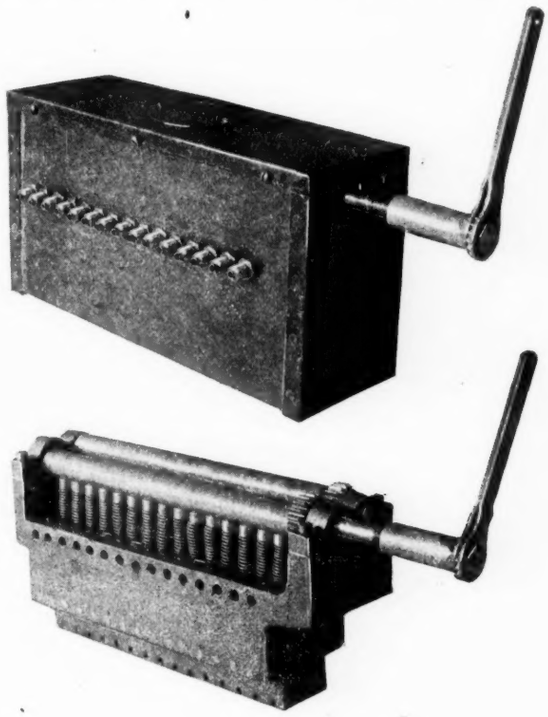
Single-Feed System Oils Car from Seat

Multiple-Plunger Hand Pump and Reservoir Supplies Oil Under Pressure to All Points on Chassis

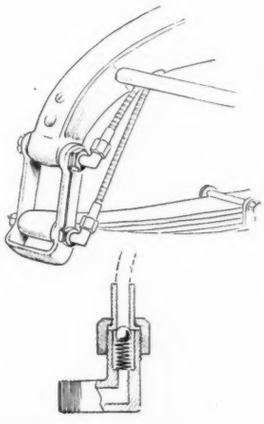
THERE has been a noticeable tendency toward the use of oil for the lubrication of car and truck chassis during the past two years. Now comes a centralized system of lubrication, the Semco-Skelly, in which a reservoir furnished with a number of tubes feeds oil under pressure simultaneously to all the points on the chassis requiring lubrication, by a few movements of a small lever situated at the driver's seat. Manufacture is now in progress on this new lubricating system by the Smith & Egge Mfg. Co., Bridgeport, Conn. It consists of a sheet steel reservoir inside of which is placed a multiple pump with a separate plunger for each of the tubes. As shown in one of the illustrations, these plungers are arranged in parallel sets of fifteen, with a cam above each set of plungers. These cams give ⅜ in. throw and are geared together, 180 deg. apart, at the end. An extension of one of the shafts is fitted with a ratchet handle which projects through the front of the seat. The overall dimensions of the reservoir are 12 in. by 4 in. by 7 in. high.

As shown in the sectional drawing herewith, the plungers are spring-returned and double-ball intake and delivery valves are used in the pump. In the model now being made there are thirty separate plungers. A corresponding number of flexible steel tubes 5/32 in. in diameter are carried along the chassis members and the ends fitted into the holes left vacant when the grease cups are removed. The ends of the tubes are fitted with unions each containing a spring ball check which holds the oil in the system and prevents leakage after the pressure has been removed.

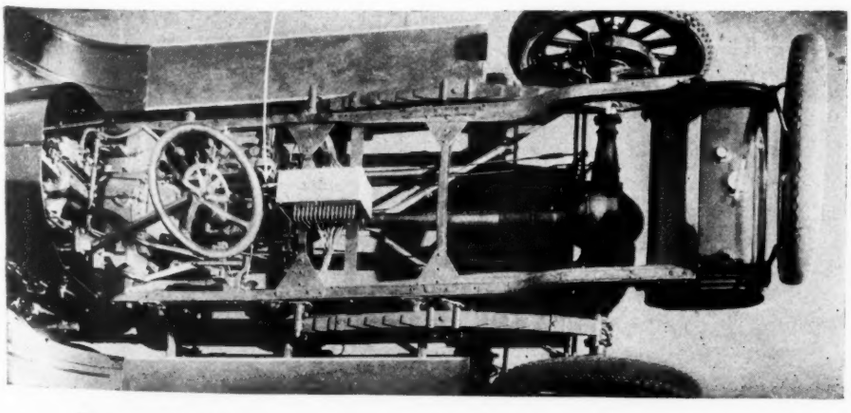
The points reached by this system include all spring shackle bolts, steering heads, brake connections, pedals, rear axle spring pads, etc. In the case of the shackle bolts, the tubes are led to the inside of the bolts instead of outside, which is the usual position for grease cups, so that they can be carried along the inside of the frame members, where they are out of sight. At practically all other points the union fitted to the end of the tube is simply screwed into the grease cup hole. The tubes are clipped to the chassis members and taped to obviate any possibility of rattle, and the tube is sufficiently flexible to take care of the relative movement of the rear axle and frame. The rear axle tubes are carried along the radius rods. In the car fitted with this lubricator, in use for more than a year, no trouble was experienced in zero weather.



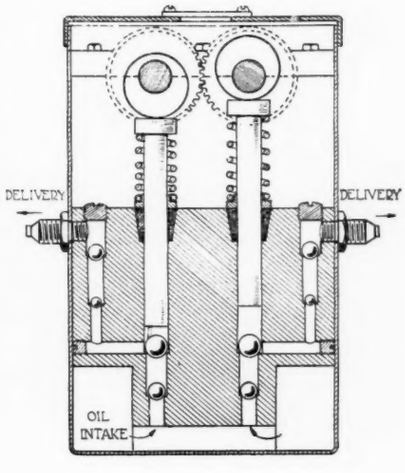
Above—The Semco-Skelly lubricator, showing the ratchet handle which operates the multiple pump. Oil is delivered through the thirty connections at the side. Below—The multiple plunger pump is a single casting, drilled vertically to form the cylinders



Sketch showing the attachment of the flexible steel tubes to the spring shackles. The section shows the ball check installed in each union to prevent leakage of oil



Chassis fitted with the Semco-Skelly lubricator under the front seat. The arrow indicates the operating handle. Right—Section through lubricator



Avery 5-10 Orchard and Farm Tractor

One of the Smallest Machines on the Market Recently Redesigned—Will Pull Any Three-Horse Farm Implement and Do Belt Work

By P. M. Heldt

WHAT is undoubtedly the most extensive line manufactured by any single firm in the tractor field is that of the Avery Co., Peoria, Ill. The line comprises seven different models of tractors, of which six are of exactly the same pattern, whereas the smallest one, the 5-10 hp., is designed on somewhat different lines. This tractor is specially suited for work in orchards, on account of its compact size, and it can be used also for all ordinary kinds of farm work. As a plowing tractor it is recommended to haul two 10-12-in. bottoms, or one 16-in. bottom.

The engine, a four-cylinder, vertical block type, with L-head cylinders, has 3-in. bore and 4-in. stroke. The cylinders are cast integrally with the upper half of the crankcase. The crankshaft is supported in two die-cast bearings, and is 1¾ in. in diameter. The valves are of 1⅛-in. diameter and have a lift of 5/16 in. Detachable cylinder heads are used, and the wrist pins are tight in the pistons. The cam followers are of the mushroom type and are provided with means of adjustment in the shape of a number of shims located in a socket formed in the tappet. The bottom half of the crankcase is also of cast iron and is provided with shelves on the inside to which are riveted the sheet metal splash troughs. A centrifugal governor is fitted and keeps the engine running in the neighborhood of 1200 r.p.m.

Gasoline is recommended as fuel, although a gasifier is fitted and some owners have been using kerosene. The gasifier is similar to that used on other Avery models and consists essentially of a combination inlet and exhaust manifold. Eleven gallons of fuel are carried in a tank located crosswise of the frame directly behind the engine. The carbureter is either a Kingston or a Zephyr. Atwater Kent ignition is used, with hand control.

Lubrication is by the circulating splash system, the oil being circulated by means of a plunger pump, bolted to the outside of the crankcase and driven by an eccentric on the camshaft. This pump takes the oil from the sump and delivers it to the splash troughs. All internal parts are lubricated by splash in the crankcase. A float type of indicator shows the level of oil in the case. Cooling is by water which is circulated through a tubular radiator of the company's own make by thermo-syphon action. Back of the radiator is located a 15½-in. fan, which is driven at twice crankshaft speed through a 1½-in. flat belt. Three-point support is used for the engine.

The clutch is of the dry-plate type, and its control is on automobile lines in that it is held in engagement by a spring. Back of the engine is located a three-speed-and-reverse gearbox, which operates on the selective sliding principle. All gears are cut from chrome-nickel steel, and are heat treated. The three speeds are 1½, 2⅛ and 4¼ m.p.h. The transmission gears are mounted on Hyatt roller and ball thrust bearings. Combined with the change-speed gear is a cross shaft driven through a pair of bevel gears. It will be understood that the primary and secondary shafts of the gearbox are in line with and parallel to the crankshaft, respectively, and a set of bevel gears is therefore required between the change gears and the final drive. The cross shaft at one end carries a spur pinion, which meshes with a gear on the differential shaft. The latter at its ends carries the bull pinions, which mesh with the bull gears on the rear wheels.

Rear wheels of 38 in. diameter by 10 in. width of rim

Avery 5-10 hp. tractor hauling Oliver disc harrow

Another view of the Avery 5-10 hp. tractor

are used, these being of the built-up type, and provided with driving lugs. The front wheels, which are 28 x 5 in. in dimension, are cast and have the guiding rings cast integral with them. The rear axle is 2 in. in diameter. The front axle is of the automobile type and has a swivel connection with the frame at the center. The front wheel hubs are bored out to form a bearing for the front axle spindle. Of the total weight of 2600 pounds, only about 25 per cent rests on the front wheels and steering is therefore comparatively easy. In order to enable the tractor to turn in a relatively small circle, the frame is narrowed at the front. In this way a minimum turning radius of 10½ ft. is obtained. Steering is effected by means of a 16-in. hand wheel at the rear end of a horizontal shaft, extending over the engine hood, and the steering motion is reduced at the forward end through a bevel pinion and gear and a spur pinion and sector. This sector is mounted on a shaft extending up through a high bracket secured to the fore part of the frame. At the bottom of the bracket the shaft carries a forwardly extending lever, which is connected by links to levers on the steering knuckles.

A pressed steel seat is fitted, which can be adjusted up and down and swings sideways. There are two control pedals, one for the clutch, which is provided with a clutch brake, and the other for the brake, which acts on a drum on the differential gear. Two control levers, for the spark and throttle respectively, are mounted on a bracket on a cross bar in front of the driver. A swinging draw bar is fitted, to enable the driver to make a short turn. The exhaust pipe is divided into two branches, which discharge close to the bull pinions, tending to keep the pinions lubricated and clear of dust.

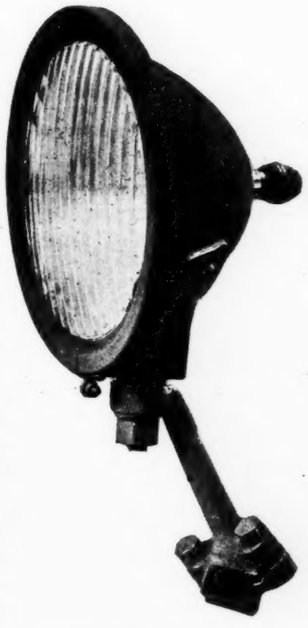
The frame is built up of 4-in. channel steel, weighing 5¼ pounds to the foot. Steel plates are riveted to the channels at the forward end. There is a platform at the rear for the driver. The rear axle is a one-piece job, being bent down, passed through holes in the frame channels, and held in place by means of brackets. A sheet metal hood extends over the top of the engine and a slight distance down the sides, the side portions being hinged to the center portion, which is about 10 in. wide. The hood rests on two arch-shaped steel strips which are bolted to the frame, and is held in place by means of spring latches.

The tractor is provided with a 12 x 5-in. belt pulley, on the left side, in plain view of the operator. One of the features on which considerable emphasis is laid by the manufacturers is the large size of the bull gears. These are semi-steel castings, with a face of 2¼ in., and are bolted to the driving wheels by means of six lugs. The driving wheels, as already stated, are of the built-up type; that is, they comprise a central cast-steel wheel to which an extension rim is bolted. As to the capacity of this tractor, the company states that it is designed to pull a three-horse load, but on account of its greater speed and greater endurance, it will ordinarily accomplish the same amount of work in a day as four horses.

The price of this tractor is $550, which makes it probably the lowest priced farm tractor on the market.

Guide Tractor Lamp

A FIELD tractor lamp for night plowing and other night field work is manufactured by the Guide Motor Lamp Mfg. Co., Cleveland. It is of special heavy-duty construction and made dust and water tight. A lens, specially designed for the purpose, throws a broad, clear beam of light about 120 ft. forward, and spreads it to about 60 ft. at right angles to the tractor. The front diameter is 7½ in., and the lamp can be furnished either with prop standards or with an extended arm.



As yet only few tractors are equipped with electric lighting outfits, but the subject is receiving the attention of both tractor manufacturers and makers of electrical equipment. The outfits must be made specially robust for this service, on account of the severe short-period vibration in tractor work.

Handling Employment Relations Without Help from the Outside

A Collective Bargaining Plan Comprising an Organized Business Government for Handling Entirely Within Any Establishment All Matters Relating to Wages, Hours of Labor, Discipline, Discharges and Grievances

A SO-CALLED collective bargaining plan, now in operation in a Middle Western concern, but which may be applied in any manufacturing establishment, which provides for the collective bargaining between an employer and his own employees, without the intervention of any union outside the establishment, is described by Boris Emmet, Ph.D., in an article which has just appeared in the Monthly Labor Review of the U. S. Department of Labor. The plan has been thoroughly tried out by three years' operation, and has resulted in putting on a collective basis the wage bargaining of the establishment, as well as the hours of labor, discipline, discharges and adjustment of grievances.

Under the scheme there are three separate bodies, known respectively as the senate, the cabinet and the house of representatives. The senate and the cabinet, both of which represent the interests of the firm, were created simultaneously in June, 1914. The organization of the employees, termed the house of representatives, was created one year later.

The members of the senate are salaried employees directly connected with the planning of the work of the institution, namely, heads of departments, their assistants, superintendents and their assistants. Application for membership must be submitted in writing to the secretary of the senate after the applicant has secured the indorsement of the firm and of at least one member of the senate. A majority vote of the members present is required for election. Membership ceases upon termination of employment with the company. Each member of the senate has one vote. By a two-thirds vote of the members present the rules and regulations governing the deliberations may be amended. Regular meetings are held once a week, but special sessions may be convened whenever occasion arises. The officers of the senate are a president, vice-president, treasurer, secretary and sergeant-at-arms, all elected by the membership for a term of one year.

Election of Representatives

The members of the house of representatives are elected from among those employees of the company who have been in continuous service for at least six months. This qualification is at present relatively unimportant for the reason that four-fifths of the employees of this company have been in its service more than six months. The representatives are elected by popular vote of the employees, in the ratio of 1 representative for every 15 employees, but each department, however small, has at least one representative. Each member of the house has 1 vote. The officers of this organization include a president, vice-president, treasurer, secretary and sergeant-at-arms, all elected by popular vote. Elections are held regularly twice a year, during the first weeks of February and August. Regular meetings of the employees' representatives are held every other Tuesday and special meetings may be called whenever necessary. The rules of procedure of the body may be amended by a two-thirds vote of its membership.

The cabinet consists of members of the executive board of the company, and has the final word in all matters referred to it by the joint action of the house and senate. Members of the cabinet may attend the meetings of either the senate or the house, but have no power to vote. Unless especially requested, however, members of the firm do not, as a rule, attend any of the sessions of the representative organizations of the employees.

The jurisdiction of the house and senate is unlimited. These bodies are privileged to discuss and act upon any proposition that may affect the interests of the employees and the firm. A proposition may originate in either house, but must also be referred to the other house for discussion and action there. In case of disagreement in the decisions reached the disputed points are referred to a joint conference committee consisting of an equal number of representatives of both organizations. The conference committee endeavors to reach some mutually satisfactory compromise, and usually succeeds. The compromise is then submitted to the cabinet for approval. As a matter of actual practice, propositions agreed to by both houses in the manner indicated above are usually assented to by the firm.

Joint Standing Committees

Under the provisions of the scheme there are a number of standing committees consisting of an equal number of representatives from both organizations. The most important of these are the betterment committee, which hears complaints and adjusts grievances, and the welfare committee, which deals with matters affecting the general comfort and welfare of the employees. There are many other committees, mostly of minor importance, such as a committee on appropriations, in charge of expending the funds annually appropriated by the company for entertainments, athletics, etc., a program committee for entertainments, and a fire-drill committee. New committees are created whenever necessity arises for handling special questions.

A discharged employee has the right to refer his case to the betterment committee. If the decision of the betterment committee is not satisfactory to the employee, he may file a notice to that effect with the "professional" secretary of the house of representatives and the senate. The latter two organizations then select a board of review consisting of five persons, two selected by the senate, two by the house, and the fifth by mutual consent of both organizations. The majority decision of the board is final. The board has full power over discharge cases and may reinstate any employee who, in its opinion, was wrongfully discharged. The company, however, specifically reserves the right to lay off employees on account of lack of work, and a lay-off, even when in effect equivalent to a discharge, is not subject to the jurisdiction of the board.

By a special resolution adopted April 17, 1918, a permanent wage committee was created. This committee is composed of one member selected by the employees of each factory department and one employee chosen to represent the office and clerical force of the firm. The functions of this committee, as defined in the resolution, are as follows: (1) To recommend and pass upon general changes in wages; (2) to suggest and pass upon minimum and maximum rates to be paid for the various operations according to skill involved, length of service, and steadiness in attendance; (3) to sit with the

factory planning board, composed of the superintendents, for the purpose of passing upon individual increases in wages; and (4) to receive complaints of individuals to whom increases were denied.

That this collective bargaining scheme has been of benefit to the employees may be seen from the list presented below, enumerating some of the more important matters dealt with and adjusted collectively, as well as from the brief account given later of the changes in wages during the last 18 months.

Ordered that raw materials be sold to employees at cost plus 15 per cent	Apr. 23, 1915
Ruled that no freight be carried on elevators between 7.15 and 7.45 a. m. and 11.30 a. m. to 12.15 p. m.	Feb. 22, 1916
Ordered that 1 week's vacation with pay be granted to those in service 1 year or longer	Apr. 25, 1916
Introduced a 48-hour week	June 16, 1916
Ordered that 2 weeks' vacation with pay be granted to those in service more than 3 years	May 20, 1916
Decided that, whenever possible, promotions be made from rank and file	Sept. 19, 1916
Employed a "professional" secretary for the house and senate	Jan. 10, 1917
Granted increases in wages of 5 and 10 per cent	Jan. 23, 1917
Formulated rules of procedure to govern a board of review to handle discharges	Jan. 10, 1917
Decided that the positions of enlisted men be held open for them	May 29, 1917
Granted an increase in wages of 5 per cent	June 20, 1917
Agreed to readjust wages in accordance with the changes in the cost of living	Jan. 23, 1918
Created a permanent committee to deal with wage questions	Apr. 17, 1918

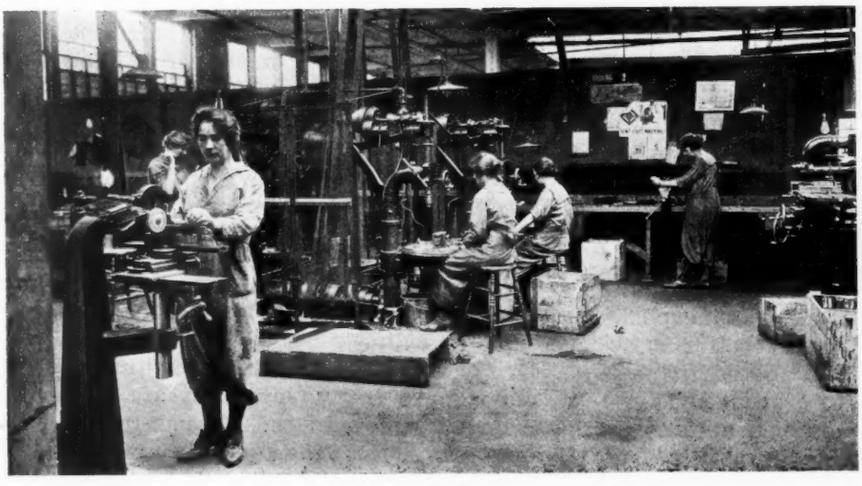
In these days of advancing prices the attention of employees is centered on the question of wages. Since the beginning of 1917 the question of wages has been the subject of frequent discussions of the representative bodies. The procedure of arriving at wage changes was somewhat as follows: The workers, feeling the need of larger incomes, usually called a meeting of their representatives and by resolution instructed them to make certain demands for increases in wages. The matter would then be taken up at the next meeting of the house for the purpose of arriving at a definite figure. As a rule, the house, being more familiar with the general conditions of business, modified considerably the demands of its constituents. The figure agreed upon by the house would then be referred to the senate. The latter, after detailed discussions and informal conferences with the management, then arrived at some decision. In cases of disagreement the matter went through the regular procedure of reference to a joint conference committee and then to the firm, which, in the great majority of instances, approved the compromise arrived at by the joint conference committee.

On Jan. 29, 1917, an increase of 10 per cent was granted to employees with a continuous record of one year or more, and of 5 per cent to those in service less than one year. On June 20, 1917, an additional all-round increase of 5 per cent was given.

In the early part of December, 1917, the representatives of the employees, in view of the still mounting cost of living, submitted a demand for an additional all-round wage increase of 10 per cent. The matter was referred to the senate, where it was discussed at great length. The opinion prevailing in the senate was "that inasmuch as it would not be right to ever cut wages, it might be unwise to grant increase after increase, as the cost of living rises, if such raises are made permanent, * * * but that temporary raises as long as this high cost of living remains on the same level, or goes up, are necessary." In view of the difference in the viewpoints of the house and the senate the subject was referred to a joint committee, which was instructed to work out some equitable method for the adjustment of wages to the rising cost of living. The action of this committee was announced on Jan. 9, 1918. It suggested that periodic (monthly) changes in wages be made in accordance with the changes in the prices of commodities. A resolution to this effect was passed and subsequently approved by the firm. In accordance with this resolution, the company on Jan. 23 made the following announcement:

> The company believes there is justice in the suggestion that the wages of the employees be readjusted in accordance with the higher cost of living. It wishes to meet the suggestion by paying a separate high-cost-of-living envelope to each employee once a month. This envelope will contain an amount of money which will represent the average increased cost of living to each employee.
>
> This amount will be figured by using Bradstreet's index figures as a basis. These index figures represent an average of the prices of 96 articles used in everyday life. As the prices change, these index figures change, so that they are a fair measure of the increase in the cost of living. These figures have been used by Bradstreet's since 1904 and are recognized all over the United States as being impartial and reliable.
>
> As these monthly index figures are not available until the 15th of the month the index figures of November the 1st will be taken instead of December 1st, and this November the 1st figure will be continued to be used as a basis. Therefore, the high-cost-of-living envelope for December will be the percentage of difference between the index figures of November the 1st and December the 1st. The high-cost-of-living envelope for January will be the difference between November the 1st and January 1st. and so on. This payment will be made on the second Tuesday of every month.
>
> The company does not obligate itself to continue this payment indefinitely, and as soon as circumstances arise that make this payment unnecessary or impossible to maintain the employees will be advised through the house of representatives of this fact.

This new wage arrangement was to be retroactive to December, 1917, when the wage demand of the employees was presented. Since the date of the announcement, the following percentages of the regular earnings of the employees have been paid as cost-of-living bonuses: For the month of December, 1917, 5 per cent; January, February and March, 1918, 6 per cent; and April, 1918, 8 per cent.



Nearly 200 men who have gone into national service have been replaced by women operators in the plant of the Elgin Motor Car Corp. The results have been so satisfactory that the company is planning to enlarge its force of female workers for various kinds of light machine and general factory work

AUTOMOTIVE INDUSTRIES
The Automobile

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Fool-Proofing the Tractor Engine

MOTOR truck manufacturers in the early years experienced no end of trouble as a result of the inclination of the drivers to overload their machines. As a preventive, plates were attached to the dashboard warning the driver and owner that the guarantee on the machine would become void if the latter was overloaded; but even this did not seem to have the desired effect. Finally it was concluded that the one effective way to prevent overloading was to so limit the engine power that the truck was incapable of taking overloads up hill. It is far better to so design the truck that it cannot be abused than to trust to the driver's intelligence to prevent abuse.

A similar line of reasoning may be applied to tractors and especially to tractor engines. We hear a good deal of farmers abusing their tractors by hooking on four bottom plows when a three-bottom is all the tractor was designed for. It seems that the engine is the part which suffers most from such abuse, as the pressures on the bearings are too high and perhaps the cooling system is inadequate to take care of the heat absorbed by the jacket under overload conditions.

Tractor engines should be protected by simply making it impossible to produce excessive bearing pressures and excessive cylinder temperatures. That these engins have not been so designed in the past has been due largely to the fact that they have been evolved from the automobile engine which works under much less severe conditions. Whereas the automobile engine carries an average load of about 20 per cent its maximum, the tractor engine in plowing works at 70 to 80 per cent its maximum load. From this it will be readily perceived that if the tractor engine bearings were no larger, in proportion to the cylinder dimensions, than automobile engine bearings, they would wear out very quickly. As a matter of fact, the tractor engine always has larger bearings, but still they are not large enough. They ought to be so large that even under full load the engine works smoothly, without pounding and without danger of the bearings heating excessively. Then there is no possibility of "abusing" the engine as far as the bearings are concerned. Of course, the engine weight will be increased thereby. There is plenty of chance in most tractors of cutting down weight where such cutting down can do no harm, and even were this possible, it would be preferable to carry around a little additional weight if this would result in a smooth running engine.

Large bearings imply a robust crankshaft, which will not yield appreciably under the stresses imposed upon it. With a substantial crank, large bearing surfaces and adequate cooling capacity, it is absolutely impossible to abuse an engine by overloading it. A tractor engine should not need any nursing, but should be capable of standing up under continuous full-open throttle operation.

Oil Cooling of Kerosene Engines

BEFORE a liquid fuel can burn it has to be vaporized because only when the fuel is in the gaseous state can its molecules approach sufficiently close to the molecules of oxygen in the air to effect a chemical combination.

As the temperature of vaporization of kerosene extends from about 300 to 500 deg. Fahr., this fuel cannot draw its heat of vaporization from the atmosphere, like high test gasoline, but must have heat supplied from outside sources. This heat may be supplied to the fuel before being mixed with the air, to the air previous to mixing, to the mixture on its way to the cylinder or to the mixture after it has entered the cylinder.

Each of these methods has something to commend it, and all are now in practical use. The difficult problem with most of them seems to be to control the heat supplied to the fuel mixture in accordance with the load on the engine. At low engine loads and speeds the fuel is less energetically sprayed than at high speeds and full load, and as the fuel globules

then are larger, a higher degree of heat is required to effect vaporization in the limited time available, whereas the temperature of the exhaust under these conditions is actually far lower.

If some of the fuel remains unvaporized at the time of ignition, combustion is retarded, with the result that much more heat goes into the waterjacket than would be the case if the mixture were completely in the gaseous state and burned almost instantaneously.

In a four-cylinder engine it seems necessary to supply heat to the mixture before it enters the cylinders, because if the fuel is still in the globular state it is impossible to get equal qualitative distribution, some cylinders receiving a richer mixture than the others, owing to the greater inertia effect on the liquid fuel particles than on the air. In two-cylinder engines there is less danger of such faulty distribution owing to the simple form of the inlet piping and in a single cylinder engine there can be, of course, no question of unequal distribution.

If the mixture is introduced into the cylinder cold, the advantage of a greater volumetric efficiency is gained. The fuel must be thoroughly vaporized before ignition, if the conversion of heat into mechanical energy is to be commensurate in efficiency with that obtained in the gasoline engine.

This is not possible where water cooling is employed, as the water keeps the cylinder wall temperature down to less than 212 deg., and it is impossible to draw heat from a wall at this temperature to vaporize fuel whose vaporization temperature extends up to 500 deg.

It is this condition that has brought about the introduction of oil cooling in tractor engines. Mineral oils can be safely heated to between 400 and 500 deg. and oil at this temperature in the cooling jacket not only insures the vaporization of the fuel introduced into the cylinders in a finely divided liquid state, but it tends to lower the loss of heat to the jacket from the burning charge, by reducing the temperature difference between opposite sides of the cylinder wall.

Thus oil cooling and high cylinder wall temperatures seem to be advantageous from several points of view. There is, however, the question of preignition and consequent knocking to be considered. To eliminate this, either very low compressions must be used or water injection must be resorted to.

Oil is now employed as the cooling medium on a number of tractor makes and we should not be surprised to see the practice extend.

Italy Stages Automotive Exposition

ITALY, which has been practically in the front yard of the war and which has had to defend her finest cities against attacks, has recognized the essential character of the automobile and other automotive apparatus to the extent that one of her leading manufacturers has assisted in staging what might be designated a war apparatus exposition along the lines suggested in AUTOMOTIVE INDUSTRIES Aug. 24. At that time it was suggested that there be staged in New York and Chicago exhibits of automotive apparatus serving in the war and that the receipts from such an exhibition be turned over to war organizations, such as Red Cross, Y. M. C. A., K. of C., Salvation Army, etc.

The following letter from the Fiat company at Turin, Italy, expresses a lofty sentiment along this line. It shows that in Italy, too, there is necessity for bringing the automobile and all automotive apparatus into their true field in the war:

"Editor AUTOMOTIVE INDUSTRIES:

"By following Mr. Beecroft's suggestion the last remnants of the denigrators of the "pleasure car industry" would be sensibly reduced, the industry would finally come into its own, viz., the recognition of its *essential* character, and the charitable institutions he alluded to (Red Cross, Y. M. C. A., etc.) would be the richer to a considerable amount to help them with their work.

"The thought that Fiat has for this time forestalled Mr. Beecroft's wishes and had already put in practice the suggestion he makes in his article is very gratifying to us, and we think you will be interested to know that at Bologna we are actually exhibiting in a local show the only output of our war industry, viz., aero engines, transport trucks and agricultural tractors.

"When we consider that all the efforts of our firm during the last 4 years have been devoted to warlike purposes, you will agree with us that we could not enhance with a better show the actual products of our factory.

"In accordance with Mr. Beecroft's suggestion the profit of the show will be handed over to the Fund for War Orphans and we will be happy in the thought that the industry will have been an instrument in both helping the war and in alleviating the consequent ravages of it.

"We are glad to ascertain the identity of ideas and sentiments which are binding the two Allied Nations, United States and Italy, and we will look forward confidently to the future for a stricter union of the two countries. Hail Columbia!

Yours faithfully,
FIAT, Società Anonima, Torino."

—

THE call for improvements in internal combustion engines raised in connection with our military aircraft program has resulted in much work being done on rotary valve and sleeve valve engines. However, in airplane work, where weight efficiency is the prime consideration, the poppet valve stands firmly intrenched, and no other valve construction seems to stand any chance of competing with it. There is, of course, a chance that the noiseless sleeve valve and rotary valve engine will receive more consideration in the automobile industry after the war and that experimenters who produce successful engines of this type may yet reap their reward.

□ Latest News of the

Detroit Subscribes $29,868,935

Automotive Industry Gave the City a Big Push in Going Over the Top

DETROIT, Oct. 21—Automobile and truck manufacturers and those of the allied industries have subscribed most liberally to the Fourth Liberty Loan, in some cases doubling and tripling their Third Loan subscriptions. The large subscriptions of such firms as Ford, Dodge Brothers, Packard, Cadillac, Hudson, Lincoln, Continental, Fisher Body and others have contributed largely to the brilliant showing of Detroit, the first city in the United States with a population of over 100,000 to "go over the top" with an over-subscription of $6,000,000. In some instances manufacturers who have been slow in either converting their plants or in following suggestions of the war industries board were not able to contribute as generously as might have been expected.

The Ford subscription to the Fourth Loan is 150 per cent greater than to the Third Loan. The Paige-Detroit Motor Car Co. increased its subscriptions by 100 per cent. At the Packard plant the average bond purchased per employee was $90, as compared with $67 for the Third Loan. The 1318 workers at the Motor Products Co. averaged more than $100 per man, the total subscription being $138,750. At the General Aluminum & Brass Co. 947 employees bought $66,200 worth of bonds, or more than double what they had purchased in the Third Loan.

At the plant of Morgan & Wright, where 800 of the 3500 workers are girls, the latter subscribed an average of $95 each. The total subscriptions by the workers was $354,000, to which $135,000 was added by the firm. The employees of the Timken-Detroit Axle Co. averaged $103 worth of bonds per man. The Lewis Hall Iron Works subscribed two and one-half times as much as for the last loan.

The workers at the Holden Avenue plant of the Lincoln Motors Corp. made 100 per cent subscriptions, totaling $128,350, or four times the Third Loan total. The Motor Products Corp. and employees subscribed $238,000, as compared with $102,400 for the Third Loan. Both company and employees doubled their former subscriptions.

Tabulation of Subscriptions to the Fourth Liberty Loan Campaign—Detroit District

Packard Motor Car Co.	$1,000,000
Hudson Motor Car Co.	877,900
Maxwell-Chalmers Co.	300,000
Studebaker Corp.	250,000
Timken-Detroit Axle Co.	225,000
Detroit Steel Products Co.	100,000
Morgan & Wright	135,400
Michigan Lubricator Co.	27,000
Michigan Lubricator Co. employees	52,000
Northern Engineering Works	73,000
Northern Engineering Works employees	27,000
R. H. Collins, president Cadillac Motor Car Co.	450,000
Detroit Steel Products Co.	150,000
Continental Motors Corp.	200,000
Mr. and Mrs. Henry B. Joy	100,000
Detroit Steel Castings Co.	100,000
Anderson Electric Car Co. employees	44,800
W. O. Briggs, president Briggs Mfg. Co.	30,000
Roberts Brass Co.	17,350
Roberts Brass Co. employees	24,650
Michigan Pressed Steel Co.	100,000
Mailometer Co.	10,000
Mailometer Co. employees	9,200
Gray Hawley Mfg. Co.	1,000
Gray Hawley Mfg. Co. employees	2,400
Candler Radiator Co.	4,800
Metal Wood Mfg. Co.	7,000
Metal Wood Mfg. Co. employees	7,450
Sewell Cushion Wheel Co.	3,500

(*Continued on page* 734)

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Dupont Heads Flint Varnish

DETROIT, Oct. 23—W. W. Mountain, president and general manager of the Flint Varnish & Color Works has resigned as the company's chief executive officer and member of board of directors to become associated with John N. Willys. The board has also accepted the resignations of James E. Kepperly as vice-president and director, and B. A. Greene secretary and purchasing agent. The former is general manager of the Curtiss Aeroplane & Motor Co. of Buffalo. The latter will become affiliated with Dort Motor Co. Lammot Dupont, vice-president of the E. I. Dupont de Nemours company, was elected to the presidency to succeed Mountain. S. J. Sohlinger, who has been vice-president and assistant general manager for nearly 2 years was made general manager of the company and elected to the board of directors. F. M. Howard, treasurer, was also elected to the board.

—

No Airplane Show Next Year

NEW YORK, Oct. 24—The Manufacturers Aircraft Association has abandoned plans for its annual show during the coming year. The directors last week adopted resolutions against such a show because of the necessity for devoting all time and energy to government requirements.

—

Artillery Tractors in Production

WASHINGTON, Oct. 24—Five-ton and ten-ton artillery tractors are in quantity production of approximately 500 of each type per month, and the production is steadily increasing, according to announcement by Major General C. C. Williams, Chief of the Army Ordnance.

Orders for 117,154 Vehicles

Motors and Vehicles Section of Quartermaster Contracts Placed in Four Weeks

WASHINGTON, Oct. 24—During the past four weeks, the Motors and Vehicles Section of the Quartermaster Corps has placed contracts for various types of motor trucks, tractors, motorcycles, bicycles and passenger cars aggregating well in excess of $130,000,000. A summary of the contracts shows that included in the total are 41,722 trucks and chassis, 3000 delivery cars, 9858 passenger cars, 18,755 motorcycles and 25,000 bicycles. It is stated there are all for the recently organized Motor Transport Corp.

The total of 41,722 trucks includes the order for 25,000 class B vehicles which was placed two weeks ago and also an order for 5000 Militors, 4000 of which are to be made by Packard. Also included are the 17,500 Nash, F. W. D., Pierce-Arrow and Garford trucks, contracts for which were placed last week. Although the Quartermaster Corps estimates the total value of the contracts at $130,000,000 it seems likely that this figure is low and that it should be nearer to $230,000,000. Following is a summary of the contracts:

800	3½-ton trucks
202	2-ton trucks
600	1½-ton trucks
600	5-ton chassis
1020	3½-ton chassis
6250	3-ton chassis
2100	2-ton chassis
565	1½-ton chassis
5000	Militor trucks
1200	Class AA chassis
24,500	Class B chassis
3584	10-ton trailers
150	4-wheel trailers
13,500	F. W. D. trucks
8000	Ford touring cars
1000	Dodge touring cars
300	Dodge winter cars
558	Limousines
3000	Delivery cars
18,775	Motorcycles
25,000	Bicycles

—

Paige to Maintain Service

DETROIT, Oct. 21—In sections where Paige dealers are going to relinquish their agencies the company will endeavor to make arrangements with dealers of other cars to maintain Paige service in those territories.

—

"Eagles" from Kearney Nov. 15

DETROIT, Oct. 16—Henry Ford's shipbuilding plant at Kearney, N. J., is progressing rapidly, and it is believed production of Eagles will start there Nov. 15.

Automotive Industries

Car Output Holds Steady

Average Weekly Production Maintained for Months Despite War Work

DETROIT, Oct. 22—Despite war work production of cars has been maintained at a steady level for some months past; the average weekly output has been about the same.

The Maxwell plant, which is engaged on a wide variety of war work, has been producing an average of 125 cars daily for several months. The production of Chalmers has been 30 a day since August. This plant is working on an order for armored artillery tractors and also on one for 5-ton artillery tractors in addition to working on motors, transmissions and clutches for tanks, two-horse reels, gun limbers and two sizes of shells. The company is also making airplane parts at Dayton.

Production at the Willys-Overland plant has been averaging 225 daily since September; Paige and Saxon, 25; Liberty, 5; King, 4; Columbia, 3; Dort, 25.

Saxon expects to build 1700 cars during the remainder of the year and now has 60 per cent of the most essential parts in stock. The company has started work on the Government order for Class AA trucks and will deliver 50 during November. Liberty, which also has an order for this type of trucks, will start production Nov. 1, and expects to deliver 30 the first month of production.

Work on gun carriages is progressing very rapidly. Up to date 70 have been made and 20 have been shipped. The initial shipment of five left the plant 2 weeks ago. In a few months the Toledo plant will be producing shells at the rate of 4000 a day.

Ford is getting ready for quantity production on its 15,000 order for 3-ton tanks.

Packard is preparing to start production of the 3-ton trucks, for which it received an order from the Government for 5250. It is believed when quantity output is reached the company will be making 600 to 700 a month. An order for 4000 Militor tractors has been received, and the company will be ready for production by the first of the year.

The Columbia Motor Car Co. has enough material on hand to build 300 cars this year. Within 30 days it will be in quantity production on the G. M. C. ¾-ton truck order. The capacity of the plant is four or five trucks a day, but production will depend on the ability of General Motors to furnish axles.

In addition to making kitchen trailers for the Government, the King Motor Car Co. will continue to make repair parts for ambulances for the Marine Corps.

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Marine Engine War Service Committee

WASHINGTON, Oct. 23—A War Service Committee representing the marine internal combustion engine and accessory industries has been formed and consists of the following seven members: James Craig, James Craig Engine & Mach. Wks., Jersey City; Charles A. Criqui, Sterling Engine Co., Buffalo; Ora J. Mulford, Gray Motor Co., Detroit; Charles W. Pank, Fairbanks Morse & Co., Chicago; Eugene A. Riotte, Standard Motor Construction Co., Jersey City; J. A. Seymour, McIntosh & Seymour Corp., Auburn, N. Y.; Richard R. Young, Union Gas Engine Co., San Francisco. Mr. Riotte is chairman of the committee. One of the first duties of the committee will be the preparation of a questionnaire which will be filed by every marine engine builder in the country. The committee has established headquarters at 29 West 39th Street, New York.

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S. A. E. Section Meetings Abandoned

DETROIT, Oct. 23—The Spanish influenza epidemic has played havoc with the S. A. E. Section meetings. Buffalo, Indianapolis and Detroit Sections have all been compelled to postpone their meetings indefinitely.

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Wichita Motor Adds Tractor

WICHITA FALLS, TEX., Oct. 23—The Wichita Falls Motor Co., which for some time has produced motor trucks, is entering the field with a farm tractor. It is a four wheel machine with a four cylinder, vertical, 4¾ x 6 valve-in-head engine with magneto ignition. It has two speeds forward and one reverse with drive through gears to the rear wheels and all driving mechanism operating in an oil bath. The weight is 4500 lb. and the drawbar pull 3000 lb. It will sell for $2,000.

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Many Detroit Additions

DETROIT, Oct. 22—Among building permits granted this week in Detroit were the following:

Hudson Motor Car Co., one-story storage and repair building, 100 by 240 by 30, to cost $45,000.

Clayton Lambert Mfg. Co., one-story water tank, 17 by 17 by 15, $4,000.

Detroit Shell Co., addition to factory, to cost $2,000.

Paige-Detroit Motor Car Co., $1,000 addition to plant.

Maxwell Motor Co., addition to plant, to cost $900.

Canadian Merger of Four Companies

General Motors Consolidated with McLaughlin and Chevrolet—Continue Branches

OSHAWA, ONT., Oct. 21—An amalgamation that will prove of far-reaching importance to the motor vehicle manufacturing industry has been effected by the consolidation of the McLaughlin Motor Car Co., the Chevrolet Motor Co. of Canada, Ltd., and the McLaughlin Carriage Co., Ltd., with the General Motors Co. The arrangement will be effective from Nov. 1.

One of the primary objects of the consolidation is the reduction of production costs. All the present plants, branch houses and distributing stations in Canada will be operated as heretofore and, in addition, engines which have formerly been imported will be manufactured in Canada, together with axles, transmissions and all other important parts.

With this end in view the General Motors Co. recently purchased a site in Walkerville, Ont., of 38 acres, where manufacturing operations will be conducted as soon as materials can be obtained and buildings erected. Provision will also be made from time to time to take care of the Canadian business of the Cadillac, Oldsmobile, Scripps-Booth, General Motors trucks and Samson tractor lines. All the plants in Canada will be operated to full capacity, it is stated, as soon as the raw material situation permits.

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Pool Allied Air Resources

WASHINGTON, Oct. 18—An agreement by which the aircraft resources of the United States and its Allies are to be developed under a joint program was the chief result of the trip of John D. Ryan, Second Assistant Secretary of War in charge of aircraft, to Europe with Secretary of War Newton D. Baker. Details of the plan, said Mr. Ryan on his return here, cannot be disclosed at this time.

In the operation of the planes in battle, he explained, Marshal Foch and the field commanders, Generals Pershing, Petain and Haig, will continue to control the air fleets as they do the other sections of the armies. In describing as much as could be told of the joint air program, Mr. Ryan told that each country will use its production resources and that the air forces of the three countries, France, United States and Great Britain, will be supplied out of this production on a pro rata basis.

Adopt Specifications for Gasoline

Standard Tests and Requirements Set for Truck and Airplane Fuels

WASHINGTON, Oct. 18—Following conferences between the Specifications Commission of the Allies and the American Committee on Standardization of Petroleum Products, standard specifications for motor and aviation gasoline have been adopted.

Under these specifications aviation gasoline has a far higher end point than commercial grades of fuel; motor gasoline, which is for the use of motor transport vehicles, is slightly different from the commercial grade. Ordinary commercial gasoline has an end point of approximately 450 deg. Fahr. Under the new specifications aviation gasoline has an end point of 347 deg. Fahr. for domestic purposes and 257 deg. Fahr. for the fighting grade, and motor gasoline of 420 deg. Fahr.

Following are the specifications as adopted by the Committee on Standardization of Petroleum Specifications:

SPECIFICATIONS FOR MOTOR GASOLINE

QUALITY: Gasoline to be high grade, refined and free from water and all impurities, and shall have a vapor tension not greater than 10 lbs. per sq. in. at 100 deg. Fahr. temperature, same to be determined in accordance with the current "Rules and Regulations for the Transportation of Explosives and Other Dangerous Articles by Freight"—paragraph 1824 (k)—as issued by the Interstate Commerce Commission.

INSPECTION AND TESTS: Inspection—Before acceptance the gasoline will be inspected. Samples of each lot will be taken at random. These samples immediately after drawing will be retained in a clean, absolutely tight closed vessel and a sample for test taken from the mixture in this vessel directly into the test vessel.

Test—One hundred cubic centimeters will be taken as a test sample. The apparatus and method of conducting the distillation test shall be that described in Bureau of Mines Technical Paper No. 166, Motor Gasoline.

(a) Boiling point must not be higher than 140 degrees Fahr.
(b) 20 per cent of the sample must distill below 221 degrees Fahr.
(c) 45 per cent must distill below 275 degrees Fahr.
(d) 90 per cent must distill below 336 degrees Fahr.
(e) The end or dry point of distillation must not be higher than 428 degrees Fahr.
(f) Not less than 95 per cent of the liquid will be recovered from the distillation.

SPECIFICATIONS FOR AVIATION GASOLINE

1. *COLOR:*—The color shall be water white.

Test—Inspection of a column in a standard 4-ounce oil-sample bottle.

2. *FOREIGN MATTER:*—The gasoline shall be free from Acid, undissolved Water and Suspended Matter.

Acid Test: The residue remaining in the flask after distillation is completed is shaken thoroughly with 1 cc. of distilled water. The aqueous extract must not be colored red on addition of a few drops of methylorange solution. *Water and Suspended Matter* would be in evidence in the test for color.

3. *DOCTOR TEST:*—The gasoline shall yield a negative doctor test.

Directions for making doctor test on gasoline:

(A) *Preparation of reagents:*—Sodium Plumbite or "doctor solution": Dissolve approximately 125 grams of Sodium Hydroxide (NaOH) in a liter of distilled water. Add 60 to 70 grams of litharge (PbG) and shake vigorously for 15 to 30 minutes, or let stand with occasional shaking for at least a day. Allow to settle and decant or siphon off the clear liquid. Filtration through a mat of asbestos may be employed if the solution does not settle clear. The solution should be kept in a bottle tightly stoppered with a cork.

Sulphur: Obtain pure flowers of sulphur.

(B) *Making of Test:*—Shake vigorously together two volumes of gasoline and one volume of the "doctor solution" (10 cc. of gasoline and 5 cc. of "doctor solution" in an ordinary test tube; or proportional quantities in a 4-ounce oil-sample bottle may conveniently be used). After shaking for about 15 seconds, a small pinch of flowers of sulphur should be added and the tube again shaken for 15 seconds and allowed to settle. The quantity of sulphur used should be such that practically all of the sulphur floats on the surface separating the gasoline from the "doctor solution."

(C) *Interpretation of Results:*—If the gasoline is discolored, or if the sulphur film is so dark that its yellow color is noticeably masked, the test shall be reported as Positive and the gasoline condemned as "sour." If the liquid remains unchanged in color and if the sulphur film is bright yellow or only slightly discolored with gray or flecked with black the test shall be reported Negative and the gasoline considered "sweet."

4. *CORROSION AND GUMMING TEST:*—The gasoline when subjected to the corrosion test shall show no gray or black corrosion and no weighable amount of gum.

Directions for Making Test:—The apparatus used in this test consists of a freshly-polished hemispherical dish of spun copper, approximately 3½ in. in diameter.

Fill this dish to within ⅜ in. of the top with the gasoline to be examined and place the dish upon a steam bath. Leave the dish on the steam bath until all volatile portions have disappeared.

If the gasoline contains any dissolved elementary sulphur, the bottom of the dish will be colored gray or black.

If the gasoline contains undesirable gum-forming constituents, there will be a weighable amount of gum deposited on the dish.

Acid residues will show as gum in this test.

Interpretation of Results:—CORROSIONS: It is specified that no gray or black deposit shall be formed. This wording is intended to admit gasolines that have so small a quantity of sulphur that the deposit is peacock colored.

GUM: It is specified that there shall be no weighable amount of gum. The intention is to refuse admittance to gasolines that show an amount that can be readily weighed in this style of dish.

The distillation method and apparatus shall conform to those outlined and described in Bureau of Mines Technical Paper No. 166, entitled "Motor Gasoline, Properties, Laboratory Methods of Testing and Practical Specifications."

VOLATILITY AND DISTILLATION RANGE —EXPORT GRADE:

When 5 per cent of the sample has been recovered in the graduated receiver the thermometer shall not read more than 149 degrees Fahr. or less than 122 degrees Fahr.

When 50 per cent has been recovered in the receiver the thermometer shall not read more than 203 degrees Fahr.

When 90 per cent has been recovered in the receiver the thermometer shall not read more than 257 degrees Fahr.

When 96 per cent has been recovered in the receiver the thermometer shall not read more than 302 degrees Fahr. and the end point shall not exceed this temperature by more than 27 degrees Fahr.

At least 96 per cent must be recovered in the receiver from the distillation.

The Distillation Loss shall not exceed 2 per cent when the residue in the flask is cooled and added to the distillate in the receiver.

VOLATILITY AND DISTILLATION RANGE —FIGHTING GRADE:

When 5 per cent of the sample has been recovered in the graduated receiver the thermometer shall not read more than 158 degrees Fahr. or less than 140 degrees Fahr.

When 50 per cent has been recovered in the receiver the thermometer shall not read more than 203 degrees Fahr.

When 90 per cent has been recovered in the receiver the thermometer shall not read more than 235 degrees Fahr.

When 96 per cent has been recovered in the receiver the thermometer shall not read more than 257 degrees Fahr. and the end point shall not exceed this temperature by more than 27 degrees Fahr.

At least 96 per cent must be recovered in the receiver from the distillation.

The distillation loss shall not exceed 2 per cent when the residue in the flask is cooled and added to the distillate in the receiver.

The United States War Department requires the Fighting Grade to be colored Red after inspection and acceptance.

VOLATILITY AND DISTILLATION RANGE —DOMESTIC GRADE:

When 5 per cent of the sample has been recovered in the graduated receiver the thermometer shall not read more than 167 degrees Fahr. or less than 122 degrees Fahr.

When 50 per cent has been recovered in the receiver the thermometer shall not read more than 221 degrees Fahr.

When 90 per cent has been recovered in the receiver the thermometer shall not read more than 311 degrees Fahr.

When 96 per cent has been recovered in the receiver the thermometer shall not read more than 347 degrees Fahr.

At least 96 per cent must be recovered in the receiver from the distillation.

The distillation loss shall not exceed 2 per cent when the residue in the flask is cooled and added to the distillate in the receiver.

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Canada Admits Tractor Radiators

OTTAWA, ONT., Oct. 19—Radiators imported with tractor attachments and furnished only to supply sufficient cooling when the attachments are placed on an automobile, may be admitted without duty under the terms of the order-in-council contained in Memo. 2166B.

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Overland Exports Handled from New York

TOLEDO, Oct. 18—Headquarters for export of the Willys-Overland Co. are to be removed to New York in anticipation of the greatly expanded business in prospect both now and after the war. R. T. Williams, export manager, will remove to the new location, while E. C. Morse, who has been handling Willys-Overland affairs at Washington, will also make his headquarters in New York.

Navy Uses Libertys Exclusively

Now Has 900 Seaplanes So Equipped in Service—Whole Atlantic Coast Patrolled

WASHINGTON, Oct. 18—Using the Liberty engine almost exclusively and having received more than 1500 of them, the U. S. Navy has now over 500 seaplanes in service abroad and more than 400 seaplanes in service in this country, according to a statement made in Congress this week by Congressman Padgett.

Beginning the war, said the Congressman, with one air station at Pensacola, Fla., and with 30 officers and 300 enlisted men, the flying service has increased and now comprises stations in France, England, Ireland, Canada and all along the Atlantic coast, using 40,383 officers and men, of whom 16,621 are actively engaged in operations against the enemy. Schools for training aviators have been established in the Central West and near the Pacific coast. For training dirigible pilots a school was established in Ohio and another will soon be constructed elsewhere.

Practically the entire Atlantic coast, stated the Congressman, is now patrolled by American seaplanes and several cases have been reported of enemy submarines sunk by our flying boats.

During the month of September, 1918, aircraft of the U. S. Navy engaged in patrol flights covered 404,775 miles and at the same time training flying boats traveled 1,317,460 miles. Actual figures of the work abroad are withheld, as it is considered most wise to keep this from the public for the present.

On April 27, 1918, an American dirigible abroad made a continuous flight for 25 hr. and 43 min., during the course of which three convoys were escorted for 13 hr. and 50 min. in a zone mined and patrolled. The French Government praised this feat highly.

The Navy flying forces have also been exceedingly active in destroying enemy submarine and naval bases, and since Aug. 15 have been engaged steadily in bombing enemy bases in Belgium.

When war was declared, says the statement, 93 heavier-than-air seaplanes had been previously delivered to the Navy and 135 were on order. Of the 93, only 21 were in use, the remainder having been worn out or lost. These seaplanes were of the N-9 and R-6 types, now used solely as training planes.

After eliminating types tried and found unsuited, the Department fixed on two sizes as standard and adopted the Liberty engine for the entire program. Owing, however, to some little delay 700 other engines were purchased.

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New Commission Plan

WASHINGTON, Oct. 21—Applications for commissions in the Motor Transport Corps, Division of Military Aeronautics, Bureau of Aircraft Production or other divisions of the Army, will hereafter be handled directly by the Military Training Camps Association offices as established throughout the country. Applications sent directly to any Army corps will be referred to the association. Journeys to Washington for commissions will be useless, as the applicant will in turn be referred to the association office nearest his home.

The proper procedure for securing a commission, states the new order containing the above rules, is for an applicant to watch the press until the division he is interested in is reported to require officers, and then he may file his application, applying to the nearest association office, where he will be given complete information and later examined and interviewed. Men who are particularly qualified for some special service in the Army and who desire commissions may make application in advance of any definite statement of a need for such officers. Following is a list of the offices of the Military Training Camps Association to which applicants for commissions can apply:

New York	19 W. Forty-fourth St.
Boston	Room 330, 84 State St.
Philadelphia	117 Commercial Trust Bldg.
Atlanta, Ga.	78 S. Pryor St.
Chicago	Consumers Bldg.
Cleveland	37 Wade Bldg.
St. Paul, Minn.	1013 Pioneer Bldg.
Dallas, Tex.	420 Interurban Bldg.
Kansas City, Mo.	New England National Bank Bldg.
Portland, Ore.	Corbett Bldg.
San Francisco	1020 Mills Bldg.
Los Angeles	Van Nuys Bldg., 210 W. Seventh St.
Washington, D. C.	War Service Exchange, State War and Navy Bldg.

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Bids on Chains Sought

WASHINGTON, Oct. 21—The Postoffice Department requests bids on nonskid chains to be used on 36 x 6 pneumatic tires, in lots of 10 pairs or sets or in lots of 25 pairs or sets. Bids are also invited on cross chains for these, and bids will be considered on other nonskid devices to fit these size tires. Bids will be received up to 2 o'clock Nov. 4. Bidders are required to submit samples and descriptions of any device other than "Weed" chains. Prices are to include delivery to any postoffice operating Government-owned trucks, and are also to be quoted as f.o.b. factory. The price bid can also be stated as for one pair of chains instead of in lots as above. Bidders should specify if the prices quoted will hold good for the balance of the present fiscal year or the period of time they will remain in effect.

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Plenty of Chrome Ore

WASHINGTON, Oct. 18—The chrome ore supply in the United States is sufficient, the situation is in hand and additional investments for production are not necessary for the present, according to the War Industries Board. This has come about because the consumption of chrome has been reduced by alterations in the war program and through the production of largely increased supplies of chrome in the United States.

Demand in Australia Excellent

Lack of European Cars Creates Boom for American Products —Roads are Good

MELBOURNE, AUSTRALIA, Aug. 22—The demand for automobiles in this part of Australia continues far in advance of the supply. The entire lack of European cars during the past 3 years has created a boon for American cars but the majority of these fit tires far too small for the kind of country the car must be operated in here.

While the farm tractor is practically unknown in this part of Australia there is a wonderful opportunity for some type that will not become bogged in soft ground. This is a country where huge tracts of land are cultivated, quite a large number of agriculturists harvesting 3000 acres annually. In such areas a light tractor that can be put to a great many jobs will have a very great sale. At present farm tractors are being experimented with in some of the highlands in the Straits Settlements on plantation work but little development work has been done in Australia.

The motor truck was not taken in the manner it should have, as many of our merchants experimented with trucks with rather unsatisfactory results. This was very largely due to lack of good mechanics and the sentiment is gaining ground that the most efficient method of operating trucks is to own a fleet and have a first class mechanic to look after them.

Roads within a 10-mile radius of Melbourne are good and well suited for truck work. Further in the country districts during the winter months the roads are of little use.

At present everybody in Australia appears to be prosperous, which should be the case, as Australia is one of the largest producers of food stuffs, wool and meats. As soon as the war is over and shipments of cars from America are permitted there will be a big movement in the industry.

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Propose Washington S. A. E. Section

WASHINGTON, Oct. 18—Consideration is being given the possibility of forming a Washington section of the Society of Automotive Engineers. In all probability final action will be taken at the meeting to be held Nov. 6. There are at present about 200 members of the society whose work keeps them continually in Washington.

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Investigate Foreign Coal Situation

WASHINGTON, Oct. 23—The U. S. Fuel Administration has appointed a special commission to inquire into conditions and Government regulations affecting the coal industry in foreign countries. The commission will consist of Walter E. Hope, S. Brinckerhoff Thorne and James H. Allport. They will sail soon for Europe.

No More Gasless Sundays

Seven of Them Saved 1,000,000 Gal.—Priorities for Overseas Shipments

WASHINGTON, Oct. 19—The Fuel Administration has withdrawn its request for gasolineless Sundays, but the need for conservation still exists and in only a slightly lessened degree. So far, no other plan to take the place of gasolineless Sundays has been perfected, though plans are being made and it is expected that a substitute measure will be submitted very soon. It is likely that this will take the form of a voluntary pledge from motorists.

When the first gasolineless Sunday was inaugurated, Sept. 1, the idea was to conserve stocks of gasoline east of the Mississippi so that there might always be a sufficient supply on the Atlantic seaboard to insure prompt and plenteous shipments overseas. Now, however, the Fuel Administration has adopted another means of insuring the overseas supply and effective at once will issue priority orders for gasoline to go abroad to our fighting forces. In other words, overseas demands get first call on the supply available.

The seven gasolineless Sundays saved approximately 1,000,000 gal. of gasoline. No exact figures have been compiled. The Fuel Administration is working on such figures now and expects they will be ready about Nov. 1. The conservation measure has not materially affected the stocks of gasoline east of the Mississippi. Following are the figures:

STOCKS OF GASOLINE ON HAND

September 16		October 14	
Motor Bbl.	Aviation Bbl.	Motor Bbl.	Aviation Bbl.
2,949,640	340,883	3,134,731	166,369

These figures represent the entire gasoline reserve east of California and is not all available for export, as it is stored in territory as far west as Wyoming and includes all interior storage in the various oil producing localities.

The peak load of domestic consumption has now been passed and it is hoped that the new priority regulations for overseas shipments combined with a new conservation plan will make it possible to fill all requirements.

As a further measure to conserve gasoline, Chairman Bernard M. Baruch of the War Industries Board has ordered that the manufacture of all gasoline stoves be discontinued for the present.

It is pretty definitely established that motorists will be asked to restrict the use of gasoline by approximately 20 per cent. This will be done by a voluntary pledge system and it is likely that cards or coupon books for rationing fuel will be adopted.

One such system at present under consideration contemplates the issuance of coupon books with coupons of various colors for the different months. Such coupons would vary in value in proportion to the quality of gasoline produced and the quantity used.

For example, a blue coupon for October might be given a value that would permit the holder to purchase two gallons of gasoline on that coupon in October. If stocks of gasoline were considerably depleted in October, leaving not a great amount for November, the yellow or pink or green November coupon might have a value of only one gallon of gasoline. Similarly, the orange coupon for January might have a value of three gallons of gasoline if production and stocks on hand were sufficient to warrant motorists using gasoline in such quantities.

Such a plan is favored because of its elasticity. It would permit the government authorities to ration gasoline in exact proportion to production and consumption.

Another idea of the manner in which the conservation program may be arranged is indicated by a plan of the Division of Transportation of the Governmental Emergency Commission. Under this war workers in the city of Washington are to be carried to their work by private cars. War workers may hail any car not already filled going in the direction of their work between 7 and 9.30 a. m. and returning home from 4.30 to 6.30 p. m. It is felt that the action of this committee may have considerable influence in having similar suggestions adopted in other cities where considerable numbers of cars continually carry but one or two passengers.

Oil Production Down Slightly

Gasoline Output, Too, Falls Off —First Eight Months Ahead of Last Year

PRODUCTION

	August, 1918	July, 1918
Crude oil (bbl.)	28,534,275	29,170,718
Gasoline (gal.)	330,335,046	332,022,095
	Stocks on Hand	
	Aug. 31, 1918	July 31, 1918
Crude oil (bbl.)	13,946,595	14,026,525
Oils purchased to be re-run (bbl.)	1,082,892	1,548,971
Gasoline (gal.)	285,446,538	349,928,604
Kerosene (gal.)	424,281,481	432,807,129
Gas and fuel (gal.)	569,016,413	519,012,839
Lube. (gal.)	137,496,986	136,460,207
Wax (lb.)	176,197,680	176,539,564
Coke (ton	19,912	17,943
Asphalt (ton)	88,446	92,597
Miscellaneous (gal.)	459,891,496	450,086,589

NEW YORK, Oct. 23—The production of both gasoline and crude oil dropped slightly during August as compared with July; but the total production for the first 8 months of 1918 is considerably ahead of the first 8 months of 1917. Stocks of both gasoline and oil have decreased slightly.

During August the daily average production of gasoline was 10,655,969 gal., as against 10,710,390 in July, which is a loss of 54,421 gal. Stocks of gasoline on hand as of Aug. 31 are 64,482,066 gal. less than the quantity on hand July 31. During July the production of crude oil fell off 636,443 bbl., the output for August being 28,534,275 bbl. as compared with 29,170,718 bbl. for July. Stocks of oil on hand decreased 1,079,930 bbl. during the month.

The gain in the production of oil and gasoline during the first 8 months is a substantial one. The output of crude

Total Output of Refineries in U. S. for First Eight Months of 1917

1917	Crude (bbl.)	Other Oils (bbl.)	Gasoline (gallons)	Kerosene (gallons)	Gas and Fuel (gallons)	Lubricating (gallons)	Wax (pounds)	Coke (tons)	Asphaltum (tons)	Miscellaneous (gallons)	Losses (bbls.)
January	24,839,772		203,618,724	137,248,370	469,596,208	60,941,062	39,558,627	44,627	49,894	27,331,019	941,924
February	23,083,433	no account	184,602,595	129,074,504	446,964,925	54,631,765	36,370,297	42,047	40,619	23,685,686	941,110
March	26,230,188	1st 6 mo.	220,523,571	159,028,978	494,855,838	64,345,221	40,868,930	48,839	52,823	26,977,334	870,380
April	25,994,938	1917	228,945,164	157,826,945	462,846,339	63,218,215	41,037,511	46,099	62,849	30,959,901	957,533
May	27,253,391		238,816,209	147,894,846	504,859,695	65,926,007	38,686,364	43,535	67,612	31,086,377	979,245
June	26,453,210		233,671,746	151,477,333	496,742,434	61,045,757	38,075,280	42,513	67,931	30,205,172	1,011,568
July	26,776,856	2,435,533	244,145,292	161,679,053	599,454,966	64,335,905	40,158,033	42,641	65,272	92,359,401	1,111,511
August	27,900,623	2,376,580	254,464,491	149,528,513	632,151,971	64,107,817	38,999,341	46,240	73,878	92,708,312	1,286,141
Total	208,532,361	4,812,113	1,808,787,792	1,193,758,542	4,107,472,376	498,551,749	313,754,383	356,541	470,878	355,313,202	8,099,412

Total Output of Refineries in U. S. for First Eight Months of 1918

1918											
January	23,842,587	2,300,334	242,632,044	119,358,184	547,866,248	56,625,425	39,238,858	41,216	54,854	70,995,829	1,078,181
February	23,386,676	2,298,333	234,324,619	121,218,320	510,165,397	58,300,914	35,087,337	42,371	42,033	75,134,088	983,992
March	26,239,662	3,696,872	269,647,968	151,228,007	587,985,804	69,308,351	43,597,019	44,248	56,901	94,865,148	1,097,489
April	26,201,544	3,956,244	293,396,162	153,703,682	578,255,341	71,022,204	40,173,524	45,674	51,242	89,242,012	1,182,020
May	28,510,698	4,112,023	319,391,202	160,590,760	631,586,209	79,589,755	42,544,633	48,864	60,449	88,627,491	1,269,281
June	28,140,479	3,483,270	315,023,445	151,840,252	628,842,033	74,420,996	41,317,794	46,605	50,321	81,110,922	1,282,177
July	29,170,718	5,951,537	332,022,095	156,828,826	658,439,682	79,303,107	41,691,551	48,914	58,433	159,374,139	1,338,304
August	28,534,275	6,376,353	330,335,046	149,678,850	671,113,871	72,892,879	41,829,516	51,759	59,715	163,355,034	1,337,327
Total	214,026,639	32,174,966	2,336,752,581	1,164,446,881	4,814,254,585	561,461,611	325,480,232	369,651	433,948	822,694,663	9,568,971

was 5,494,578 bbl. greater in the last 8 months than in the same period last year. And the gain in gasoline production for the period was 527,964,789 gal. The stock of kerosene on hand decreased slightly, but the stock of fuel oil increased by approximately 50,000,000 gal. There was also a slight increase in stock of lubricating oil.

On page 730 is a table of the total output of refineries in the United States for the first eight months of 1917 and 1918.

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French Delco Company

PARIS, Oct. 4—A French Delco company has just been formed here, with exclusive rights from the Dayton concern, to manufacture electric lighting and starting apparatus in France and in French colonies. The company, which is known as the Société Francaise des Appareils Delco, has the following prominent men on its board of directors: Clement-Bayard, Tomine, Ballot, Barbaroux, Continsouza, Nicaise, Patin and Repusseau. Mr. Clement-Bayard is the president of the automobile company bearing his name; Mr. Tomine was business manager for the Delage company prior to the war; Ballot is the biggest motor specialist in France; Mr. Barbaroux is chief engineer of the Lorraine-Dietrich company, after having been at the head of the Delaunay-Belleville company for many years; Mr. Nicaise is president of the same company; Mr. Repusseau is a body builder and Buick agent in France.

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U. S. Rubber Sells $6,000,000 Notes

NEW YORK, Oct. 23—For the purpose of paying off in part $9,000,000 of 5 per cent debenture bonds of the General Rubber Co., the U. S. Rubber Co. has sold $6,000,000 7 per cent five-year secured notes to Kuhn, Loeb & Co., New York. The General Rubber Co. is a subsidiary of the U. S. company. The remainder of the maturing General bonds will be paid off in cash.

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Liberty Engine Output 150 Daily

DETROIT, Oct. 21—Liberty engine production is steadily increasing and each of the five representative manufacturers in this district is running far ahead of the quota up to date. The total output of all the plants averages 150 engines a day. The present daily production of the individual plants is as follows: Ford, 42; Buick, 20; Nordyke & Marmon, 10; Packard, 35; Lincoln, 35.

Costs and Speed in Tractor Tests

Eight Tractors Plow Heavy Soil at Hempstead—Ravine Worries Operators at First

HEMPSTEAD, L. I., Oct. 19—Eight tractors participated in a demonstration held on a field just outside of this town this afternoon. The event was held under the auspices of the Nassau County Farm Bureau and the fuel consumption was recorded by the Bureau of Weights and Measures.

The tractors each plowed a plot 4 rods wide and 40 rods long, making 1 acre, and disked the ground afterward. Fuel consumption was taken for the plowing only. The ground was damp prairie sod that was very sticky and not easy to turn up, yet the tractors did themselves credit both in the time consumed and the amount of fuel used. A ravine that averaged 3 to 4 ft. in depth crossed the line of the furrows and added considerably to the difficulty of plowing, as gears had to be changed in nearly every case as the banks of the ravine were quite steep.

Observers accompanied the tractors and made records of stops and kept tabs on the furrow depth. The performance of the machines was not marred by any more serious difficulties than a couple of dropped plow parts and the failure of several of the plows to scour in the sticky soil.

The cause of the failure to scour was carelessness in allowing the shares to get rusted. The operators deemed it sufficient to polish them off with emery cloth, whereas they should have been put through sandy soil for at least 4 hr. before being put in sticky soil.

One of the features of the demonstration was the driving of the Maxim tractor by Katherine Freeman from the New York State School of Agriculture. She had come to witness the event and was invited to drive the tractor, which she did in a most creditable manner, making the turns at the headlands and operating the plows herself.

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May Move Government Departments

WASHINGTON, Oct. 23—There has been some little agitation of late for the removal of certain government departments and bureaus from Washington to other less congested and more central locations. The heads of several departments have been asked to submit opinions on the subject, these departments including food, fuel, war industries, war trade and war risk. There has also been some talk of the Aircraft Production Board removing lock, stock and barrel to New York.

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Trade Commission Halts Unfair Methods

WASHINGTON, Oct. 24—The Federal Trade Commission has ordered the Wayne Oil Tank and Pump Co. of Fort Wayne to discontinue unfair trade practices admitted by the concern, including misrepresentation to customers, price-discrimination, and efforts to discredit and hamper competitors. The commission's order was issued in agreement with the concern which waived right to introduce testimony in support of its practices.

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Specialists in Foreign Advertising Open New York Office

NEW YORK, Oct. 21—The J. Roland Kay Co., Chicago, handling the foreign advertising of a number of firms, including the Willys-Overland Co., the U. S. Rubber Co. and the Remington Arms U.M.C. Co., has opened a New York office at 18 East Forty-first Street. The company also has offices at London, England; Tokyo, Japan; Sydney, Australia; Capetown, South Africa, and Buenos Aires, Argentina.

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International Harvester Suit Dismissed

WASHINGTON, Oct. 23—The anti-trust suit brought against the International Harvester Co. has been dismissed. This is in accordance with arrangements made for the dissolution of the company approved by the Department of Justice.

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Trego Has Small Fire

NEW HAVEN, Oct. 23—The Trego Motors Corp. was visited by a small fire last week. A frame building was burned and no great damage done. Production will be delayed slightly for a few days.

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Production Not Affected by Influenza

DETROIT, Oct. 21—As a result of an investigation made by the regional industrial commission of Michigan at the request of the Government it was found that the production of war work has hardly been affected on account of the epidemic of Spanish influenza. Output has fallen off only slightly less than 1 per cent and in the Jackson and Lansing district a trifle less than 5 per cent. It is reported this is very favorable compared to other states.

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American Steel Tube Doubles Capital

TOLEDO, Oct. 22—The American Steel Tube Co. has increased its capital stock from $50,000 to $100,000. The company has contracts to furnish several million steel tubes to the Government, and recently doubled its output by purchasing the old Landers Brothers Co. plant, Buckeye Street and the Terminal Railway.

Results of Hempstead Tractor Demonstration

Name	Rating	Fuel	Fuel per Acre: Gasoline	Fuel per Acre: Kerosene	Cost per Acre*	Time Plowing One Acre	Acres per Hour	Depth of Plowing	No. and Size of Plows
Moline	9-18	Gasoline	3.5	...	$.945	1:31	.769	8 in.	2-14
Cleveland	12-20	Gasoline	3.5	...	.945	1:18	.769	7 in.	2-14
Case	9-18	Kerosene	...	4.0	.600	1:44	.577	7 in.	2-14
Fordson		Kerosene	...	4.75	.713	1:28	.682	7 in.	2-14
Knickerbocker	Form-A-Tractor	Gasoline	3.37	...	.911	1:37	.617	7 in.	2-12
Titan	10-20	Kerosene	...	2.75	.413	1:13	.822	8 in.	3-14
Parrett	12-25	Kerosene	...	2.75	.413	1:11	.845	7 in.	3-14
Maxim	12-24	Gasoline	5.75	...	1.553	1:27	.681	7 in.	2-14

*Gasoline figured at 27 cents per gal., kerosene, 15 cents.

Airplane Observers Needed

U. S. Air Service Opened to Civilians and Men in the Ranks—3 Months' Training

WASHINGTON, Oct. 18—The United States Air Service is urgently in need of observers. The service has been thrown open for the induction of draftees, registrants and civilians, and an opportunity is given men in the ranks to become connected with this service.

The call for war observers has come directly from General Pershing and has been emphasized by Major General Kenly. Pilots and observers are trained in reserve brigades and sent overseas in squadrons as rapidly as possible, fully organized and equipped. The first reserve brigade, which is to consist of 36 squadrons, is located on Long Island on 9 different flying fields. The second reserve brigade, consisting of 4 squadrons, is located at Park Place, Tex. The third will probably be located in New Jersey or in some other district within close proximity to the Atlantic Coast.

The number to be trained in these brigades, however, will be inadequate in view of the greatly increased activities of the American air force, and it is for this reason that civilians and men in the ranks are urged to get into this service.

It is pointed out by the Division of Military Aeronautics that the training of an observer requires 3 months, when the candidate is immediately commissioned a second lieutenant and sent overseas. The training of a pilot, on the other hand, requires 8 months, with the ultimate result of the same grade of commission. Observers are required to pass the same physical tests as pilots and must have certain flying training to enable them to bring down a plane in the event the pilot is injured.

Striking evidence of the importance of airplane observers is given by the fact that in the Continental armies these men invariably are recruited from line officers of experience and are always commissioned, whereas pilots very frequently are not commissioned. The best pilots are men who have qualified first as observers.

At present there is a shortage of advanced training planes, and this is tending to hold back the training of pilots. There are plenty of primary training planes. The situation with regard to advanced training planes is improving.

Civilians or men in the ranks who desire to enter the air service should apply to any recruiting board or examining board for training as observers in the Division of Military Aeronautics.

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U. S. Motor Vehicles Not Subject to License Tax

WASHINGTON, Oct. 21—Motor vehicles owned by the Government or operated exclusively for official purposes do not require licenses from states, territories or municipalities, according to a ruling issued by the Engineers Corps, United States Army. The use of public funds for the purchase of such licenses is prohibited. If local authorities are willing to issue the various tags or plates without charge and for the convenience of Government-owned vehicles, they can be accepted and used.

Instructions to army officers, issued with the ruling, call for the use of metal plates on Government-owned vehicles stating the name of the department owning and operating the machine, together with the department number for that particular car, truck or motorcycle. These signs are to be 7 in. high and 12 in. wide and to conform generally with the regulations of the community in which they are used. The commanding officer for the Army in that district is ordered to notify the civil authorities of the kind and numbers of machines which it is expected the Army will operate. Rules demand that the Army drivers obey all speed and other regulations, and if stopped while on official business by civil authorities because of failure to carry a license tag the drivers are ordered to give full information regarding the ownership and use of the machine.

These rules do not apply to machines owned privately by Army officers who must in all cases abide strictly by the law and regulations as established by the civil authorities. And the use of any metal signs on vehicles reading U. S. A. or U. S. Army is prohibited.

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Form Munitions Patent Board

WASHINGTON, Oct. 18—A Munitions Patent Board has been formed for the purpose of co-ordinating the policies of the War and Navy Departments in patent matters. The membership will consist of Thomas Ewing, Max Thelen, representing the War Department, and Pickens Neagle, representing the Navy Department. The board has been formed for the following purposes:

1—To consider clauses in contracts of the respective departments dealing with patents.

2—Questions as to the validity or infringement of patents and the patentability of inventions.

3—Questions as to the amount of compensation to be paid for patents or for their use.

The board is empowered to recommend suitable actions or policies in regard to all patent matters brought before it for consideration.

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Coal Production Maintained

WASHINGTON, Oct. 18—Bituminous coal production for the week ending Oct. 5 was 12,585,000 tons, an increase of 1,774,000 tons over the corresponding week of 1917, and a decrease of 462,000 tons as compared with the week ended Sept. 28, which was the second highest week in coal history. Anthracite coal production amounted to 2,052,000 tons for the week ending Oct. 5; the same tonnage was produced in the corresponding week of 1917.

Truck Repair Depots in 6 Cities

Country Divided Into Sections for Motor Transport Maintenance Operations

WASHINGTON, Oct. 21—There will be six great repair bases for army motor trucks in the United States. These are to be located at Camp Holabird, Baltimore, Md.; Atlanta, Ga.; Fort Sam Houston, Tex.; El Paso, Tex.; Chicago, Ill.; San Francisco, Cal. The most important one is that at Camp Holabird, because it serves the largest district and the one that contains nearly all the important truck factories and all the principal ports of embarkation for France. The states in this district are: Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, Virginia, Kentucky, Ohio, Indiana, Michigan (lower peninsular) and the District of Columbia.

New machines only are sent to the American Expeditionary Forces, but, in order that the steady flow of them may be maintained at a maximum, the old trucks that serve the army's needs here must be kept in service as long as the repairman's skill can make it possible. The new district system will greatly facilitate repairs and reconstruction, and it will be the policy of the Motor Transport Corps to discourage major repairs at any points other than the central units.

Officers Assigned to Each District

Each district is to be commanded by a District Motor Transport Officer, to be appointed by the chief of the corps, and who will have, under the authority of the chief, control and supervision of all matters pertaining to the operations, maintenance and repair of all Class 1 vehicles and a technical supervision of all Class 2 vehicles. Class 2 vehicles are those assigned to various units outside of the Motor Transport Corps, according to the Tables of Organization. The Motor Transport Corps is responsible for the repair and maintenance of these vehicles. Class 1 consists of all vehicles operated directly by the corps.

Under the latter heading come the new trucks that are moved from the factories to the seaboard in convoy. Not only do these vehicles relieve the railroads by moving, under their own power, but they help out by taking, each, a load of government freight. Thousands of tons of freight are being moved in this way all the time. The officers and men who handle these convoys are mostly recent graduates of the corps training schools, who are sent out to complete their training by practical road work, done under the same rules that apply to the American Expeditionary Forces and with conditions duplicated as nearly as possible. Men are drawn largely from the motor trades, although mechanics of

other lines may be inducted into the service. Material for officers must combine motor or mechanical knowledge with executive ability. Both officers and enlisted men are sent overseas soon after completing their training.

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Canada Adopting Rural Express

TORONTO, ONT., Oct. 19—Rural motor express and freight lines are likely to become a prominent feature of rural life in Canada in the near future. Already one Canadian company, with headquarters in Toronto, has established such a line, and has a fleet of twenty-five motor trucks in operation. No doubt this is merely the precursor of many similar lines throughout eastern Canada. With the railways devoted almost entirely to the winning of the war and the consequent preference given to the haulage of war materials and fuel for the munition factories and the transportation of the finished products to the seaports, the small shipper is subjected to unusual hardships to get his product to the purchaser, and this is particularly true where but comparatively short hauls are required.

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Investigating Parts Stocks

BOSTON, Oct. 19—John H. Johnson, a director of the N. A. D. A., returned from Washington yesterday, where he was in conference with other officers of the organization and also with some of the members of the War Industries Board relative to the work of conservation being carried on in the New England territory.

He reported that a committee had been formed of accessory men to secure information for the board on the amount of stock that the dealers had on hand at the present time. He told the men he talked to that he found the accessory men willing to co-operate in every way with the officials at Washington, and that within a short time it would be possible to let them know where Boston stood in the way of supplies.

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Government Wants Boston Buildings

BOSTON, Oct. 19—A number of the big motor dealers in Boston have been asked by the Federal Government to submit bids for leasing their buildings to the Navy Department to house the sailors who are being trained in the Boston Naval District.

The request came as a surprise and found the dealers unprepared to make a quick response. The section proposed to be taken over by the Government comprises the buildings on Commonwealth Avenue from Lawton Street to the Jewish Temple.

The Government asked bids for eight months' occupancy, with a privilege of another year if needed.

The offers have been taken to Washington by a naval officer, and the department there will pass upon them. If the plan goes through that part of motor row on Commonwealth Avenue will be wiped out for the present, and some of the dealers think they may not go back again.

Trucks Important at Chateau-Thierry

In 3 Hours 580 Trucks Were Put in Condition to Help the Americans Beat the Hun

WASHINGTON, Oct. 18—Motor trucks played a vital part at Chateau-Thierry. When the Germans were rushing toward Paris in June there was an overhaul park south of Chateau-Thierry where disabled cars and trucks were sent for repairs. The park employed 1500 soldiers. It was filled with trucks at this particular time, trucks wrecked and shell smashed, others jolted beyond usefulness by driving over the shell-torn roads. On July 8, when the situation at the front was particularly bad and the French needed aid, General Foch ordered the Americans into the lines. They were needed quickly. The overhaul park was ordered to have every truck ready for service in 3 hours.

There were 610 trucks in the park, many of them fully repaired, a large number on which work had not yet started, others in process of repair. The commandant ordered every man at work. Officers donned overalls and joined with the privates. Only the essential parts were repaired, those that would carry the trucks over the roads. At the end of the 3 hours 580 trucks were in condition and ready to move.

Officers Volunteer as Drivers

With a shortage of drivers volunteers were called for. Many of the officers seized the opportunity to get to the front, although this was the usual work of corporals. They got the chance and together with the master mechanics and other skilled men with the grades of sergeants, whose usual duties kept them at the park, rolled out to their assigned destinations with an array of captains and lieutenants on the drivers' seats such as has never before been seen during the war.

A 3-ton truck usually carries 25 men with their packs. The 580 trucks had a capacity of 14,500 men. When troops move under normal conditions seats are put into the trucks and the speed is limited by the governors to 14 m.p.h. These trucks had no seats. The troops stood. The governors were taken off. The vehicles hit a 25 mile gait toward the front firing lines.

This event, stated a returned officer, was one of the many that served to emphasize the fact that armies cannot make sweeping advances without motor-propelled vehicles. It is only recently, despite earlier proof of this, that systematic use of huge numbers of motor trucks has been engaged in the moving of large bodies of troops. General Foch and General Pershing have recognized the importance of motor trucks in conjunction with their general ability of moving troops rapidly. They have, it was stated, realized the mobility that results from the use of motor trucks. They are moving whole divisions across wide areas, infantry, artillery and airmen, by motor trucks.

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Ask Dealers for Parts Inventories

BOSTON, Oct. 19 — Some Boston dealers have been asked by factories to send in a complete inventory of what they have in the way of parts. The intimation is that some of these parts may be requisitioned to complete cars that are nearly all assembled but for which various things like axles or springs may be shy.

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Merge Defense and Labor Sections

WASHINGTON, Oct. 18—The Section on Industrial Training for the War Emergency, Committee on Labor, Council of National Defense, which is under H. E. Miles, chairman, has been merged with the Training and Dilution Service of the United States Department of Labor, which is under C. T. Clayton. Under the merger Mr. Clayton will become the director and Mr. Miles the chief of training.

Employers interested in the training and dilution of workers, in the installation of training vestibules in factories, in factory organization and so forth, can secure much valuable information through the Training and Dilution Service, Department of Labor, to which communications can be addressed.

Heretofore the section under Mr. Miles working through the Council of National Defense has done valuable work in inaugurating vestibule schools, as has been testified to by numerous employers who by this means have overcome their labor problems. Mr. Clayton's department, an enlargement upon that of Mr. Miles, will be ready to extend similar aid to employers, according to Mr. Clayton.

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Further Curtail Road Machinery

WASHINGTON, Oct. 19—Road making machinery has been further curtailed in manufacture for the 6 months following Oct. 1, 1918, by the War Industries Board, and is limited to the manufacture of 15 per cent of six-twelfths of 1917 production for civilian uses, but in no event to exceed, with the total production, 5 per cent of six-twelfths of the 1917 tonnage. This means that not more than 15 per cent of the road machinery made in the half of 1917 can be devoted to civilian uses, while in no event can road machinery manufacturers produce more than 50 per cent of 6 months' 1917 production for all purposes, including civilian, army, municipal, state or township uses.

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Chicago-St. Louis Barge Service

ST. LOUIS, Oct. 18—It has been announced officially here that a dependable barge service between this city and Chicago will open soon. The freight rates will be about 80 per cent of the railroad rate and the bill of lading will be as useful as commercial paper. The service will be under direction of the Government, and will be through the Illinois and Michigan Canal, the Illinois River and the Mississippi.

Increased Storage of Coal

All Consumers Except Those in Class I Get More—Move Up One Class

WASHINGTON, Oct. 18—The United States Fuel Administration has authorized slightly increased coal storage for all classes of consumers except those in Class 1. Consumers not on the Preference List are authorized to lay in additional reserve supplies and consumers in Class 2 may store coal up to the limits now imposed on Class 1. Consumers in Classes 3 and 4 have both been moved up one class. Following are the regulations:

Consumers in Classes 1 and 2.

Maine, 135 days.

Massachusetts, Vermont, New Hampshire, Northern New York, 105 days.

Connecticut, Rhode Island, Southwestern New York, 90 days.

Southeastern New York and New Jersey, 60 days.

Delaware, East Pennsylvania, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, Georgia, Florida and Western Ohio, 35 days.

Western Pennsylvania, West Virginia, Eastern Kentucky, Eastern Ohio, 35 days.

Lower Michigan, 90 days.

Consumers in Class 3.

Maine, 120 days.

Masachusetts, Vermont, New Hampshire, Northern New York, 90 days.

Connecticut, Rhode Island, Southwestern New York, 75 days.

Southeastern New York and New Jersey, 50 days.

Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, Georgia, Florida, Western Ohio, 40 days.

Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 30 days.

Lower Michigan, 75 days.

Consumers in Class 4

Maine, 105 days.

Massachusetts, Vermont, New Hampshire, Northern New York, 75 days.

Connecticut, Rhode Island, Southwestern New York, 60 days.

Southeastern New York and New Jersey, 40 days.

Delaware, Eastern Pennsylvania, Maryland, District of Columbia, North Carolina, South Carolina, Georgia, Virginia, Florida, Western Ohio, 35 days.

Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 25 days.

Lower Michigan, 60 days.

Consumers Not on the Preference List are Limited to the Following Stocks:

Maine, 90 days.

Masachusetts, Vermont, New Hampshire, and Northern New York, 60 days.

Connecticut, Rhode Island, Southwestern New York, 45 days.

Southeastern New York and New Jersey, 30 days.

Delaware, Eastern Pennsylvania, Maryland, District of Columbia, Virginia, North Carolina, South Carolina, Georgia, Florida and Western Ohio, 30 days.

Western Pennsylvania, West Virginia, Eastern Kentucky and Eastern Ohio, 20 days.

Lower Michigan, 45 days.

There is no restriction on the stocks of screenings which may be acumulated by either preference or non-preference consumers, nor is there any restriction on the stocks of Indiana, Illinois, or western coal, which consumers in any class may obtain.

Supervision of the accumulation of stocks in accordance with these limits will be exercised by the several State Fuel Administrators who are authorized to make exceptions where special conditions make it necessary.

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Detroit Subscribes $29,868,935

(*Continued from page* 726)

Sewell Cushion Wheel Co. employees	6,500
King Motor Car Co. employees	6,400
General Mfg. Co.	5,000
General Mfg. Co. employees	2,950
Peninsular Machine Co.	20,000
Fisher Body Corp.	500,000
Detroit Copper & Brass Co.	250,000
Pittsburg Shafting Co. and employees	150,000
Michigan Malleable Iron Works	100,000
Michigan Stamping Co.	100,000
Michigan Smelting & Refining Co.	100,000
Paige-Detroit Motor Car Co.	100,000
Detroit Lubricator Co. and employees	84,000
Michigan Steel Casting Co. employees	71,000
Michigan Malleable Iron Works employees	50,000
Northway Motor Mfg. Co.	50,000
Buhl Stamping Co.	50,000
Russel Wheel & Foundry Co.	50,000
Michigan Steel Castings Co.	40,000
Jeffery-DeWitt Co.	40,000
Michigan Smelting & Refining Co. employees	31,750
Sherwood Brass Mfg. employees	25,400
Detroit Lubricator Co.	25,000
Commerce Motor Car Co. employees	10,600
Parish Mfg. Co.	18,150
Freuhauf Trailer Co.	1,000
Freuhauf Trailer Co. employees	2,450
Willard Storage Battery Co.	1,000
Detroit Foundry Co.	10,000
Detroit Foundry Co. employees	7,100
Sherwood Brass Co.	24,600
Sewell Cushion Wheel Co.	10,000
Detroit Motor Castings Co.	5,000
Howard E. Coffin	15,000
Detroit Iron & Steel Co.	100,000
Acme White Lead & Color Works and employees	80,000
Gemmer Mfg. Co. employees	32,600
Swedish Crucible Steel Co.	30,550
Stroh Castings Co. employees	30,000
Norval N. Hawkings	5,000
Edmund & Jones Corp.	62,500
Enterprise Foundry Co.	10,000
Enterprise Foundry Co. employees	15,000
Shuler Axle Co. employees	2,400
International Harvester Co.	15,000
Detroit Stamping Co.	1,500
Johns-Manville Co.	15,000
B. F. Goodrich Rubber Co.	21,700
Gemmer Mfg. Co.	12,800
Puritan Machine Co.	2,500
Henry Ford interests	12,000,000
Packard Motor Car Co. employees	863,650
Detroit Copper Brass Co. employees	130,000
Hupp Motor Car Co.	50,000
Detroit Seamless Steel Tube Co.	50,000
Zenith Carburetor Co. employees	46,000
Detroit Twist Drill Co.	36,000
Detroit Brass Co. employees	25,500
R. V. Chapin	25,000
Detroit Valve & Fitting Co. employees	13,300
McCord Mfg. Co. Wyandotte plant employees	9,100
Motor Truck Body Co.	1,000
Briggs Mfg. Co.	24,700
Hugh Chalmers	10,000
National Can Co.	20,000
National Can Co. employees	20,000
Alvin McCauley	20,000
Detroit Trailer Co.	6,000
Sewell Cushion Wheel Co. employees	6,500
National Twist Drill Co. and employees	150,000
Michigan Copper & Brass Co.	100,000
National Twist Drill Co. employees	50,600
General Aluminum & Brass Mfg. Co.	116,200
General Aluminum & Brass Mfg. Co. employees	66,200
McCord Mfg. Co.	50,000
Detroit Gear Machine Co.	33,750
J. W. Murray Mfg. Co. employees	41,600
Walter E. Flanders	25,000
Detroit Auto Trimming Co.	25,000
Monarch Steel Casting Co. employees	7,000
American Lubricator Co. and employees	6,000
Michigan Gray Iron Castings Co. employees	5,000
Standard Brass Works	10,000
Standard Brass Works employees	8,800
Liberty Motor Car Co. and employees	18,000
M. & S. Gear Co. and employees	12,000
Detroit Accessories Corp. and employees	11,100
Imperial Bearing Co. and employees	8,000
American Brass & Iron Co. and employees	9,350
C. M. Hall Lamp Co.	5,550
Detroit White Lead Works	5,450
Detroit Foundry Co. employees	7,100
James Couzens	200,000
Lewis Hall Iron Works employees	8,550
Accessories Forgings Co.	2,000
Premier Cushion Spring Co.	5,750
Denby Motor Truck Co. employees	17,800
Detroit Piston Ring Co. employees	4,300
Signal Motor Truck Co.	1,550
Standard Motor Parts Co. and employees	3,650
Detroit Accessories Corp. and employees	20,100
Timken-Detroit Axle Co. employees	446,200
Continental Motor Co. employees	235,000
Northway Motor Mfg. Co. employees	113,700
Federal Motor Truck Co. employees	101,200
Detroit Pressed Steel Co.	75,000
Detroit Twist Drill Co. and employees	85,000
Hupp Motor Car Co. employees	46,200
Automatic Motor Product Co. employees	45,650
Detroit Gear Machine Co.	33,750
Puritan Machine Co. employees	4,600
Swartz Foundry Co. and employees	6,150
Michigan Tool Co. and employees	16,000
Ohio Rubber Co. and employees	6,100
United States Tire Co. branch employees	3,900
B. F. Goodrich Rubber Co.	17,000
Detroit Forging Co. employees	15,150
Detroit Pressed Steel Co. and employees	26,900
Horace Dodge	500,000
Aluminum Castings Co. employees	160,000
Russel Motor Axle Co. and employees	43,000
Fisher Body Corp. Ross plant employees	38,250
Law Mfg. Co. and employees	40,000
Anderson Electric Car Co.	45,000
Bower Roller Bearing Co. employees	27,350
Federal Brass Works and employees	16,000
Bower Roller Bearing Co.	15,000
Hinkley Motors Corp. employees	20,000
Kelsey Wheel Co. and employees	139,000
Wilson Body Co. employees	75,000
Dodge Brothers	1,000,000
John F. Dodge	500,000
Horace Dodge	500,000
Mrs. Horace Dodge	100,000
Mrs. John F. Dodge	100,000
Cadillac Motor Car Co. employees	987,285
American Car & Foundry	1,500,000
Firestone Tire & Rubber Co., Detroit branch	25,000
Lincoln Motor Co.	1,000,000
Lincoln Motor Co. employees	471,300
Maxwell Motor Co. Highland Park plant	158,200
Total	$29,868,935

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Elgin Revises Its Line

CHICAGO, Oct. 19—The Elgin Motor Car Corp. has adopted an engine with cylinders ⅛ in. larger in bore—3⅛ x 4¼—for its new models, deliveries of which will start in October, and has made a number of other minor improvements. There is a slight change in the shape of the valve lifters, the fan adjustment has been made more convenient; the motor of the Wagner two-unit electric system has been raised to increase the accessibility and a steel generator coupling replaces the former leather disk. The lubrication system has been changed, and it is now pressure to the bearings with circulating splash to other parts. The bodies are now larger and the lines have been improved. The various types include a touring model at $1,395, a four-passenger military scout and a convertible sedan.

Ford Surplus Totals $175,242,728

Company Has Biggest Year in Its History—Cash Receivables Increase $26,852,084

ASSETS

	1918	1917
Real estate	$37,117,363	$28,180,582
Machinery and equip.	29,335,982	25,637,959
Material in process	44,522,562	46,762,457
Cash and receivables	91,471,851	64,619,767
Patent rights	67,981	66,637
Inventories	1,231,906	706,286
Investments	1,815	1,314
Totals	$203,749,460	$165,975,002

LIABILITIES

	1918	1917
Capital stock	$2,000,000	$2,000,000
Accounts payable	10,653,327	19,983,256
Accrued expenses	5,950,564	5,952,903
Depreciation reserve	9,902,841	6,433,936
Surplus	175,242,728	131,604,907
Totals	$203,749,460	$165,975,002

DETROIT, Oct. 21—Notwithstanding the curtailment in automobile production during the greater part of the year, the financial statement of the Ford Motor Co. for its fiscal year which ended July 31, 1918, shows that it was the biggest year in the history of the company. Its total assets and liabilities amounted to $203,749,360, which is an increase of $37,774,458, compared with total resources of $165,975,002 at the end of the preceding fiscal period and contrasts with $132,088,219 July 31, 1916, and $88,535,840 July 31, 1915.

Current assets aggregate $137,228,134 against $112,089,824 July 31 last year, and current liabilities total $16,603,891, in contrast with $25,936,159 a year ago.

The statement shows a net working capital of $120,624,243, compared with working capital of $86,153,665 at the close of the previous year.

The surplus was $175,242,728. This is an increase of $43,637,821 for the fiscal period and compares with $131,604,097 July 31 last year, with $111,960,907 July 31, 1916, and with $59,135,771 July 31, 1915. The amount added to the surplus during the year is equivalent to $2,181.84 a share on the company's 20,000 shares of capital stock of the par value of $100.

The most remarkable feature of the statement besides the enormous surplus is the large amount of cash receivables, which for 1918 totaled $91,471,851, as compared with $64,619,767, or an increase of $26,852,084. The strength of the company's finances is further indicated by a reduction of $9,329,929 in the total of accounts payable.

Fixed assets, comprising real estate, machinery and equipment, are appraised at $66,453,345, against $53,818,541 a year ago, an increase of $12,634,804 in plant investment during the year.

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National Implement Association Meets

CHICAGO, Oct. 18—To retain his position in the implement trade and attain anything like the dominancy in the tractor and power farming equipment trade the old-time retail implement dealer will have to adopt the aggressive methods of the motor car dealer:

1—Put the tractor on his floor;
2—Demonstrate it;
3—Sell it for cash, and
4—Stand ready to take care of his customer in service and repairs.

This was the consensus of the twenty-fifth annual convention of the National Implement and Vehicle Association, as far as it concerned the automotive industry, which closed here to-day after a three-day meeting.

The retail implement dealer realizes that he will have to meet the motor car dealer on the field of salesmanship if he is to remain in business. He came to Chicago last week to meet with the sales managers' division of the N. I. & V. A., and the sales managers told him so—told him, in the words of R. B. Laurie, sales manager of the John Deere Plow Co., Moline, Ill., that to escape extinction it is necessary and vital for him to add tractors and power farm equipment to his line of horse-drawn equipment.

W. L. Derry, president of the National Federation of Retail Implement Dealers' Association, speaking for himself and other retail implement dealers, assured the tractor and power farming equipment makers at the meeting that the old-time implement dealer was going to sell the tractor and power farming machinery, that the tractor maker and the power farming equipment maker wanted the retail implement dealer to sell their goods, and that the old-time dealers stood ready with a line of repairs to do the business.

Packard Surplus $13,657,860

Securities and Reserve for Taxes Show Big Gains—Notes Payable Decreased

DETROIT, Oct. 24—The surplus of the Packard Motor Car Co. as of Aug. 31 and after deducting dividends on preferred and common stock and reserve for taxes, etc., was $4,346,319 larger than for the previous fiscal year when the surplus amounted to $9,311,541. The complete statement, which is given herewith, shows a number of increases which have been brought about almost entirely as a result of the war.

For example, securities held have increased from the very small amount of $19,029 last year to the big total of $4,514,853 this year, the gain being $4,495,823. In the case of inventories the gain also has been large. The figure for last year was $18,556,600 as against $22,399,168 for this year, a net gain of $3,842,568. The amount of cash on hand has shown a correspondingly large increase, the figure for last year being $686,640 compared with $3,158,509 for this year, a difference of $2,471,869. Similarly, bills and accounts receivable show an increase of $4,386,163.

Notes Payable Decreased

On the liabilities side of the ledger, notes payable have decreased by nearly $3,000,000. Under the head of reserves for taxes, etc., there is perhaps the biggest change of any. Last year the total reserve for this purpose was $1,104,748, whereas this year the reserve amounts to $8,698,254, an increase of $7,593,506. It is largely because of this great reserve for taxes that the surplus is no bigger, for in normal times much of this reserve would be placed directly in the surplus account.

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Limousine Top to Make Seats

KALAMAZOO, Oct. 22—The Limousine Top Co. will start work immediately building 1500 seats for the Indiana and Service truck companies. These are for war trucks and carry priority numbers in the matter of material and labor. Work is being rushed on the completion of the addition to the plant.

Consolidated Balance Sheet of Packard and Subsidiary Companies

Assets

	1918	1917
Real estate, machinery, etc	$12,034,315.98	$11,792,606.00
Rights, franchises, etc	1.00	1.00
Investment in branch houses	4,058,666.66	5,741,123.00
Securities owned	4,514,853.72	19,029.00
Stock option contracts	.....	199,000.00
Inventories	22,399,168.65	18,556,600.00
Cash	3,158,509.63	686,640.00
Vehicles in transit	.....	2,334,367.00
Due by branch companies	.....	2,798,295.00
Bills and accounts receivable	5,701,177.92	1,315,014.00
Advance payments	.....	248,039.00
Deferred instalments on notes and bills receivable	720,871.19	.....
Total	$52,879,084.65	$43,690,714.00

Liabilities

	1918	1917
Common stock	$11,656,930.00	$11,840,930.00
Preferred stock	8,000,000.00	8,000,000.00
Debenture notes	5,000,000.00	5,000,000.00
Accounts payable	4,171,737.56	4,184,113.00
Notes payable	1,060,432.00	3,975,000.00
Deferred payments on real estate	.....	274,382.00
Reserve for interest, taxes, etc	8,698,254.22	1,104,748.00
Deferred purchase money obligations	633,870.26	.....
Surplus	13,657,860.60	9,311,541.00
Total	$52,879,084.65	$43,690,714.00

Lippard-Stewart on the Block

BUFFALO, Oct. 18—The business and plant of the Lippard-Stewart Motor Car Co. are to be put up at public auction by the Bankruptcy Court on Oct. 21. The property offered in the sale comprises the entire factory equipment, machine shop, stock in trade and tools and office equipment. The value of the stock, according to schedule filed with the report, is $78,533.71, and the value of the machinery, tools, etc., is $18,166.29.

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Manitowoc Foundry Sold

MANITOWOC, Oct. 21—The Manitowoc Foundry & Machine Co., Manitowoc, Wis., has been acquired by David Balkansky, one of the owners of the Manitowoc Iron & Metal Co., and the corporate style is being changed to Manitowoc Foundry Co. The capital stock has been increased to $50,000, and extensive enlargement of the casting shop will be undertaken at once. The company makes gas engine castings and also operates a commercial foundry and machining plant.

—

Sell Killen-Strait Plant

MILWAUKEE, Oct. 21—The property of the Killen-Strait Mfg. Co., Appleton, Wis., manufacturer of tractors, petitioned into receivership on Sept. 20, will be sold at public auction by Charles L. Marston, Appleton, receiver, on Wednesday, Dec. 11, at 10 a. m. The plant consists of two acres of land; a main brick machine shop and office building, 64 x 200; a foundry, pattern works, blacksmith, tin and woodworking shops, and a warehouse, 30 x 100. The machinery includes three lathes, two radial drills, two drill presses, a gear cutter, milling machine and drop forge press, and other items. The plant is equipped with electrical power and is suitable for the manufacture of farm tractors and farm machinery.

—

Chief Gets Engine Contract

PORT HURON, MICH., Oct. 16—The Chief Motor Co., which occupies the plant formerly owned by the Monroe Motor Co. and Port Huron Construction Co., has been awarded a contract to build 4000 military truck engines for the United States Government. Production will begin at once and the work is to be completed within 6 months.

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Bargaining Collectively Outside or Inside?

(*Continued from page* 713)

Even where the employees of a concern are not members of a labor organization, wage difficulties will speedily bring into being in that factory a labor organization for the purpose of getting collective action upon the question.

The manufacturer who objects to this method of action is merely contradicting his own operations when any general and outside interference threatens his industry, or when he thinks the industry should interfere in some outside matters.

Current News of Factories

Notes of New Plants—Old Ones Enlarged

It is quite usual for him through his industrial association to bargain for or against legislation, against encroachments of other industries, against crooked buyers and other common "enemies."

The laborer in his plant has just the same desire and necessity for collective action and has just as much right to assert himself in that collective way.

The matter of right is not the question; the matter of necessity or advisability is the important part of it, and how the machinery shall be worked out.

The question before the manufacturer to-day—the important decision he must make—is whether he will continue to bargain collectively with the labor organization of which he knows little and with which he does not come into contact save occasionally, or whether he will create the machinery in his own factory which will permanently exercise jurisdiction upon these matters, recognizing in the formation of that body the workers' right to be considered in the questions affecting his remuneration and his conditions of work.

Collective Bargaining Not New

He should remember that collective action upon wage systems is not a new thing, nor is it the original idea of a labor union; by legislation in favor of the employer it was for centuries the subject of national collective action; when the right of private contract was restored it was the subject of action by the manufacturer who saw no use in paying different wages for the same operation.

It has been adopted by the labor organization as the only way in which to make its power felt, and the manufacturer's objection to it is not an objection to principle of collective bargaining *per se*, but to the labor organization's very effective and embarrassing use of the weapon.

It is obvious that for a long time to come the system of payment based upon time will be the one most generally employed, and that for a given operation in any shop 75 per cent of the workers will turn out about the same amount of finished work and secure about the same pay.

This is the majority which governs the action of the labor organization, and it is the majority which will govern the necessities of the individual factory.

These are the conditions and requirements which must be met by some form of collective bargaining and also by some system of payment which will at the same time offer recognition to the individual.

New Northwestern Chemical Plant

MILWAUKEE, Oct. 21—The Northwestern Chemical Co., Milwaukee, which lost its plant at Sixty-first and State Streets, town of Wauwatosa, by fire in September, will erect a new plant costing about $35,000. The building will be 50 x 150 ft., fireproof throughout.

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Milwaukee Brass Enlarges

MILWAUKEE, Oct. 21—The Milwaukee Brass Mfg. Co., 249-251 Lapham Street, is enlarging its facilities in order to be better equipped to handle direct and indirect war work.

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Raybestos Molded Facing Replaces Woven Facing

BRIDGEPORT, CONN., Oct. 19—The Raybestos Co. has discontinued the production of Raybestos woven clutch facing, and upon the completion of orders now in hand will manufacture only the new Raybestos molded clutch facing. The price is said to be no higher than the woven facing.

—

Ford Employs 46,050

DETROIT, Oct. 19—At a recent checking up of the new payrolls of the Henry Ford interests it was found that Henry Ford employs 46,050 persons. This number includes every man working in the Highland Park plant, the shipyards at River Rouge and the tractor plant at Dearborn.

—

Fulton Foundry Acquires Factory Site

CLEVELAND, Oct. 18—The Fulton Foundry & Machine Co. has purchased 6¼ acres of land in the industrial section along the Nickel Plate Railroad in the northeastern part of the city. The property was purchased for future developments.

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New Canadian Denby Plant

WINDSOR, ONT., Oct. 19—The Denby Motor Truck Co. of Canada has purchased a site at Chatham, Ont., and will erect a new factory.

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Steel Output Increases

WASHINGTON, Oct. 18—Improvement in the steel situation of the country is shown in a survey just completed by the War Industries Board showing that pig iron is now being produced at the rate of over 42,000,000 tons and steel plates at the rate of 6,000,000 tons per year. Plate production is more than 40,000 tons a week higher than ever before. Production of all steel is at the rate of 33,000,000 tons per year. Despite these increases the war board states that the steel situation is still critical and that, for example, while we are producing 33,000,000 tons of steel a year, the demands of the Government and the Allies total 50,000,000 tons.

Mack President Hoover Steel Ball

ANN ARBOR, MICH., Oct. 19—Walter C. Mack was elected president of the Hoover Steel Ball Co. at the annual meeting of the stockholders. He takes the place of L. J. Hoover, who died recently. The other officers are: Vice-president, F. A. Stivers; treasurer, M. J. Fritz; secretary and manager, H. D. Runciman; assistant secretary, William Arnold, Jr. These officers and Dr. L. P. Hall, D. F. Zimmerman, H. A. Douglass and R. T. Dobson form the board of directors. The executive committee consists of R. T. Dobson, Dr. L. P. Hall, M. J. Fritz, F. A. Stivers and William Arnold, Jr.

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William W. Mountain, president of the Flint Varnish & Color Works, Flint, Mich., has resigned. It is reported that after a brief vacation at French Lick Springs he will enter another line of business.

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Lester W. Place has resigned as sales manager of the Allen Motor Co., Fostoria, Ohio, and will announce his future plans shortly.

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William Ross, Detroit, the engineer who designed and completed the model truck of the Louisiana Motor Car Co., Shreveport, La., has been appointed chief engineer of production of the company.

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Grover C. Farnsworth, at one time advertising manager of the former Metzger Motor Car Co., is now an ensign in the naval aviation corps, stationed on the eastern coast.

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H. F. Blanchard of Thermoid Co. a Victim of Influenza

TRENTON, N. J., Oct. 21—H. F. Blanchard, sales manager for the Thermoid Rubber Co. for the past three years, died of influenza at his home in Trenton. Mr. Blanchard was about 31 years of age.

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New Tractor Plant in Ypsilanti

YPSILANTI, MICH., Oct. 19—The controlling interest of the Michigan Press Co., manufacturer of the Perkins power presses, has been purchased by Theodore H. Millington and Charles W. Chapman. The company expects to bring out a four wheel drive tractor. About forty men will be employed. Millington, who was formerly with the General Motors Co., is president of the reorganized company; Chapman, secretary and treasurer, and C. A. Perkins, vice-president.

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Canada Adopts Gasoline Regulations

OTTAWA, ONT., Oct. 18—Regulations have been approved by the Governor-General-in-Council to control the wholesale and retail sale of gasoline in Canada. The regulations provide for the licensing of all persons who deal in gasoline and certain fees are prescribed based on the volume of gasoline sold during the previous year. In cases where dealers fail to obey the provisions of the law, the Fuel Controller has absolute power to cancel or suspend license without notice. All persons who continue to deal in gasoline without making application for a permit to do so will be subject to a penalty of $50 for each day such business is conducted in contravention of the regulations. Provision is also made for the keeping of certain sales records, and all retailers of gasoline are called upon to post in their places of business the wholesale as well as the retail cost of gasoline handled by them. One important provision of the regulations is that, for the duration of the war, the sale of gasoline on Sundays is absolutely prohibited. Retail maximum prices are prescribed for the establishments selling gasoline in quantities over a thousand gallons a month. Profits are based on a ten per cent advance over the wholesale cost delivered.

Men of the Industry

Changes in Personnel and Position

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Training and Dilution Labor Districts

WASHINGTON, Oct. 19—The United States has been divided into districts by the Training and Dilution Service of the Department of Labor, and superintendents for each will be named who will explain the purposes of the Training and Dilution Service to employers in their respective localities. In the main this will comprise explanations of the establishment of factory training departments for the conversion of unskilled into skilled workers.

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New 24-Cylinder Aviation Engine in Production

RACINE, Oct. 19—The Sieverkropp Engine Co. has started work on the construction of a 24-cylinder, two-cycle, rotory aviation engine, which is expected to develop 500 h.p. at 1400 r.p.m. The engine is of a new type recently developed by Henry Sieverkropp, president and chief engineer of the company. The 24-cylinder engine is being built at the suggestion of the technical division of the Government aircraft board, on the basis of the performance of a smaller experimental engine completed by Sieverkropp about two months ago and submitted for official tests. The engine already constructed is a 12-cylinder, two-cycle, rotary type, rated at 72 hp., but it has developed 140 hp. at 2800 r.p.m. without appreciable effort. Mr. Sieverkropp is confident that the 24-cylinder motor will weigh considerably less that 1.98 lb. per horsepower and by the use of aluminum cylinders and other economies in weight expects to reduce the ratio to practically 1 lb. per horsepower.

Winningham Out of Oil Division

WASHINGTON, Oct. 18—C. C. Winningham, who on Aug. 1 was appointed chief of the Gasoline Section and Director of Publicity of the Oil Division of the Fuel Administration, has left that division. He has taken up other work with the Department of Labor. Winningham's place is to be taken by George H. Pride, of the Heavy Haulage Co., New York, who is Regional Director for a number of eastern states for the Highways Transport Committee. Pride is giving up his work with the Highways Transport Committee.

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Edwin E. Taylor, formerly advertising manager of the Acme Harvesting Machine Co., Peoria, Ill., has resigned this position to become director of advertising for the Turner Mfg. Co., Pt. Washington, Wis., manufacturer of farm tractors, gas engines and other power machinery.

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J. G. Perrin, chief engineer of the old Lozier Motor Co., who took up government work in the aviation department directly after America's entry into war, is now manager of the Canadian plant of the Willys-Overland Co. at Toronto.

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Louis Geer has been appointed assistant to John Squires, chief of the materials division of the Denby Motor Truck Co., Detroit.

—

O. E. Harmon has been placed in charge of the service department of Fuller & Sons Mfg. Co., Kalamazoo. M. E. Fuller has been appointed employment supervisor.

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Ralph H. Ratliff, advertising manager of the Butler Mfg. Co., Indianapolis, has resigned and will take up farming.

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J. S. Burdick, for the past six years body engineer of the Locomobile Co. of America, Bridgeport, has severed his connection with the company and enlisted in government work for overseas service as automotive engineer.

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Douglas C. Halley, formerly connected with the wholesale selling staffs of Scripps-Booth and Studebaker, has been appointed a first lieutenant in the Motor Transport Corps, and is stationed at Camp Holabird, Baltimore.

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Don Ferguson, chief engineer of the old Cartercar Co., and for some time a designing and consulting engineer in Detroit and Milwaukee, has become resident engineer of the ordnance department under Major James Guthrie, commanding the Detroit district.

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Florence Gardner, secretary to A. A. Gloetzner, sales manager of the Covert Gear Co., Detroit, has been appointed purchasing agent for the Louisiana Motor Car Co., Shreveport, La.

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George Crittenden, sales manager of the old Krit company, has been commissioned a lieutenant in the navy.

AUTOMOTIVE MATERIALS MARKETS

Materials Market Prices

Acids:
Muriatic, lb..... .02 -.03
Phosphoric (85%).. .35 -.39
Sulphuric (60), lb.. .008

Aluminum:
Ingot, lb..... .33
Sheets, (18 gage or more), lb..... .40

Antimony, lb..... .13 -.13¼

Burlap:
8 oz., yd.....12.4 -.15.85
10½ oz., yd.....14.6 -.18.6

Copper:
Elec., lb..... .26
Lake, lb..... .26

Fabric, Tire (17¼ oz.):
Sea Is., combed, lb.1.65-1.70
Egypt, combed, lb.1.25-1.35
Egypt, carded, lb.1.20-1.30
Peelers, combed, lb.1.05-1.20
Peelers, carded, lb. .95-1.05

Fibre (⅛ in. sheet base), lb..... .50

Graphite:
Ceylon, lb..... .07½-.25
Madagascar, lb.... .10 -.15
Mexican, lb..... .03¾

Lead, lb..... .08 -.09

Leather:
Hides, lb..... .18 -.35¼

Nickel, lb..... .40

Oil:
Gasoline:
Auto., gal..... .24½
68 to 70 gal..... .30½
Lard:
Prime City, gal..2.50
Ex. No. 1, gal....1.70
Linseed, gal.....1.60-1.65
Menhaden (Brown), gal. 1.30-1.31
Petroleum (crude),
Kansas, bbl.....2.25
Pennsylvania, bbl.4.00

Rubber:
Ceylon:
First latex pale crepe, lb..... .60½
Brown, crepe, thin, clear, lb..... .53
Smoked, ribbed sheets, lb..... .58½
Para:
Up River, fine, lb. .64
Up River, coarse, lb. ..... .36½
Island, fine, lb... .74 -.75

Shellac (orange), lb.. .74 -.75

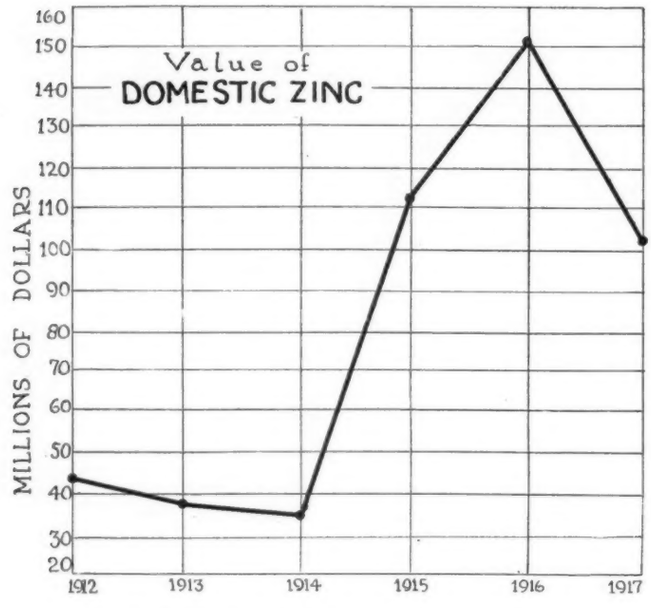
Spelter ..... .08½-.09

Steel:
Angle beams and channels, lb..... .03
Automobile sheet (see sp. table).
Cold rolled, lb..... .06½
Hot rolled, lb..... .03½

Tin ..... .80½-.82½

Tungsten, lb.....2.45-2.60

Waste (cotton), lb... .12¾-.17



Although the production of zinc from domestic ore was practically the same for the years 1916 *and* 1917 *the value has dropped greatly*

AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only Per 100 lbs.	Primes when seconds up to 15 per cent are taken Per 100 lbs.
Automobile body stock	$5.95	$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat tender, door and apron, or splash guard stock	6.05	5.95
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20
Crown fender, cowl and radiator casing, extra deep stamping	6.55	6.45

Automobile Sheet Extras for Extreme Widths:
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.

Black Sheet Extras to Apply to Narrow Widths:
Oiling, 10c. per 100 lb.
Patent leveling, 25c. per 100 lb.
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.

Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.

Truck Sales Managers Meet

CLEVELAND, Oct. 19—The National Association of Motor Truck Sales Managers, which was formed about two months ago, held its third meeting yesterday and to-day at the Statler Hotel and outlined plans of action for future work.

It has a permanent office at 1344 Wells Building, Milwaukee, where Executive Secretary J. M. Carney will conduct the organization's business.

One of the first things to be taken up is the contract with dealers, which exists to-day in many varieties. The sales managers believe they can work out a contract which will be acceptable to all the manufacturers.

It is also believed much can be done to make uniform the methods of handling time payments, and that the trading of used trucks can be made a real business and free from the abuses that grew up with passenger car trading.

An interchange of information is also planned, one of the matters to be covered being the records of shifting salesmen who go from plant to plant and work for short periods.

The next meeting will be held Nov. 15-16 at the Lafayette Hotel, Buffalo.

The directors, elected some time ago, chose the following officers: J. E. Tracey, Sterling Motor Truck Co., president; H. T. Boulden, Selden Truck Sales Co., first vice-president; W. D. Wrightmire, Winther Motor Truck Co., second vice-president; E. T. Herbig, Service Motor Truck Co., secretary; A. R. Fernald, Willys-Overland, Inc., treasurer; J. M. Carney, executive secretary.

The directors, in addition to Tracey, Boulden, Wrightmire, Herbig and Fernald, are: F. J. Pardee, Diamond-T Motor Co.; F. L. Pierce, Federal Motor Truck Co.; A. C. Burch, Clyde Cars Co.

The membership includes in addition W. B. Morse, Brockway Motor Truck Co.; B. D. Jones, Republic Motor Truck Co.; W. S. Stevenson, Bethlehem Motor Corp.; F. J. Alvin, United States Motor Truck Co.; G. W. Weller, Indiana Truck Corp.; F. R. Mitchell, Gramm-Bernstein Motor Truck Co.; C. H. Woodruff, O. Armleder Co.; J. D. Potter, American Motor Truck Co.; D. F. Wittaker, Acason Motor Truck Co.; C. H. Roberts, Bessemer Motor Truck Co.; L. Lynch, Columbia Motor Truck & Trailer Co.; W. J. Dietrich, Harvey Motor Truck Co.; C. A. Wales, Locomobile Co. of America; E. F. King, Available Truck Co.

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What Langley Did for the Science of Aviation

(*Continued from page* 718)

of 4600 ft. in 1¾ min. While the distance from the houseboat in a straight line to the point at which the aerodrome descended was only about 1600 ft., yet it was estimated by those present that this straight line distance was certainly not greater than one-third of the total length of past travels, which would mean a distance of something like 4800 ft. The length of the course as painted on a coast surveyor map and afterward measured was 4200 ft., and it, therefore, seems safe to say that the total distance traveled was about three-quarters of a mile, and the speed was, therefore, about 30 miles an hour."

Extracts From Senate Aircraft Report

(*Continued from page* 701)

and had an affirmative reply, following which he delved deeply into Mr. Hunt's experience as an engineer. Senator Reed asked Henry Ford his opinion of the Delco system and if it were as good as any and heard him say "I think it is." Senator Chamberlain questioned R. H. Collins of the Cadillac Motor Co.: "What do you think of the Delco ignition system?" and had the answer: "It cannot be better."

Senator Reed asked W. C. Leland: "What is the best ignition, in your opinion, to use with the Liberty engine?" and secured the answer: "My belief on this is very pronounced, that the type of ignition now being used, which is the Delco ignition system, is the best ignition system that we know of for this high-speed, multiple-cylinder work. We base that on our experience with the Cadillac company. We have used the Delco system since 1911."

Later in gathering testimony Senator Reed encountered an army officer who had once had trouble with the generator on the Liberty engine and he spent some time trying to get the officer to admit that it was the Delco system that had failed, but the officer insisted that it was the generator.

Many other interesting facts are revealed in the reading of the testimony. The opening inquiry was with Col. C. G. Edgar, who was in charge of aviation field construction. In the course of the interrogation the Colonel admitted that he had had no previous experience in this work and had been in the sugar business, besides being "interested in navy beans." He also testified that at the outset we attempted to match the British training fields, established four years, and tried to float 300 cadets with 600 enlisted men and 72 officers at each field, but found that we required 750 men to float 150 cadets. The reason for numerous fatalities from sickness at flying fields in 1917-1918 he showed were due to over-crowding. At Camp Kelly No. 2, where accommodations had been erected for 2100 men, 4700 soldiers had been housed.

J. E. Kepperly, vice-president of the Curtiss corporation, told how production had been hampered by frequent separate investigation by the numerous agencies, the Department of Justice, Navy Intelligence, Army Intelligence, Niagara Frontier League and the company's secret service. Often, he said, each of these agencies would make its appearance and demand to be taken through the plant and shown books and so forth, always creating a confusion and delay.

At the Packard plant Senator Reed by questioning O. E. Hunt developed that the Packard twelve-cylinder motor car engine was designed in December, 1914, and not ready for production before August, 1915, from which he drew comparisons in the time between the design and production of the Liberty airplane engine. Mr. Hunt also told of the Bugatti engine made in France, which has a cannon mounted in the crankcase and which shoots seven or eight shots, alternating incendiary and explosive shells automatically. The shooting, he said, is aimed by the control of the plane.

An interesting conversation ensued when in the testimony of George W. Houston, general manager of the Wright Martin Aircraft Corp., he mentioned George W. Goethals, and Senator Frelinghuysen inquired: "Is this George W. Goethals, General Goethals?" Houston replied: "Yes, sir," and the inquiry was made by Senator Frelinghuysen: "I understand that General Goethals' connection with the company was prior to our entrance into the war?"

At this point, states the testimony, informal discussion occurred which the reporter was directed not to record. And this was followed by additional inquiries:

Senator Frelinghuysen: "Was General Goethals' connection with the company known to the Government at the time he was called into service as an officer?"

Mr. Houston: "It was. General Goethals at that time was president of the Wright Martin Aircraft Corp. and he resigned the presidency shortly after he entered the Army as acting quartermaster general."

Senator Frelinghuysen: "Has General Goethals any interest in the stock of the company?"

Mr. Houston: "I cannot say as to his personal interests, but I do not think so."

Tests published in the testimony of the De Haviland plane equipped with a Liberty engine show that with fighter equipment it had an endurance at full throttle of 1 hr. 58 min., with half throttle 2 hr. 38 min., at 6500 ft. Its ceiling was 19,700 ft., speed in 10,000 ft. climb, 13 min., speed at ground level, 120 m.p.h., at 6500 ft., 118 m.p.h., at 10,000 ft., 114 m.p.h., and at 15,000 ft., 107 m.p.h.

Other testimony by Col. D. E. Clark of the Department of Military Aeronautics developed that he went abroad with the mission under Colonel Bolling, which investigated the merits of foreign planes, and that he recommended our adoption of:

De Haviland 9 for day bombing.

Bristol fighter for observation.

Martinsyde equipped with Liberty engine for single seater pursuit.

Spad with 150-hp. Gnome and 180-hp. Hispano Suiza engines for single seater combat.

Caproni triplane for night bombing.

The recommendations made no mention of the De Haviland 4 which we are now building. The Colonel also told that according to boasts by Lieutenant-Colonel Hall, formerly of the Hall-Scott Motor Co., 3600 changes had been made in the De Haviland 4. This was denied by the statement of another officer, Col. T. H. Bane, who stated in his testimony that the De Haviland 4 as made in this country was very similar to the British and had only very few and minor changes.

Complaints were filed by several officers in their testimony about the method used in this country of bending the cables, sustaining the planes, over the "eye" and wrapping and soldering them. It was stated that in many cases the solder does not soak through, with the result that the cable is hidden from view under a pipe-like shape formed by the solder, and is not only dangerous because it is not firmly held, but also because inspection is impossible. The British Government splices the cables after wrapping them about the "eye," and, said the various officers, the same custom should be followed here.

An interesting side-light on the failure of our Bristol airplane program was revealed in the testimony by Major H. S. Martin of the Department of Military Aeronautics, who explained that Col. D. E. Clark, who recommended the adoption of the Bristol and has been blamed for its failure, had been advised prior to his trip abroad that the Liberty engine would weigh 740 lb., and in consequence assumed that it could replace the Rolls Royce, which weighed 700 lb. In addition, said Major Martin, after the receipt of the Bristol plane in this country it was so "improved" that its weight was increased by 800 lb. and the combination of the heavier Liberty engine weighing 825 lb. instead of 740 plus the 800 lb. of added weight in the plane itself was the actual cause of the failure.

Testimony by Major G. H. Brett, Department of Military Aeronautics, supplied the committee with figures showing that 3129 airplanes had been furnished our Army in France by foreign sources up to July 31, 1918. Of these 1617 were school planes, chiefly Nieuports, and 1512 were combat planes, comprising mainly Sopwiths and Spads.

"Improvements," such as those on the Bristol mentioned above, were quite numerous. Col. H. H. Arnold, Assistant Director of Military Aeronautics, told that the compasses used in the De Haviland planes were worthless, that they had "died of improvements." "Our production people," he said, "improved on it to such an extent they made it worthless."

The English in mounting the compasses use agate to reduce the friction of the rotating member and because it is a non-conductor. We "improved" the compass, said Colonel Arnold, by putting steel on the agate, removing the non-conductor feature and making the compass worthless. In this connection it can be noted that many months ago Captain Fritt, British compass expert in this country, informed the authorities that as we used the compass it was of no value.

Examples of the worthlessness of much of the testimony are frequent. In the instance of the inquiry of the com-

mittee with members of the French Mission is a confusion of replies that is typical of much that took place. Senator New inquired of the French officers if it would not be best to make all the planes we possibly can, and received the following replies:

Edouard De Billy: "Certainly, by all means."

Colonel Tulasne: "Certainly."

Lieutenant Marquisan: "Oh, no. It is better to have one plane of the very best type than ten of an obsolete type."

Again, many witnesses, it developed, were men with high-sounding titles and little experience. In the instance of W. K. Rider, called before the committee, it developed that he was in the production engineering department of the Signal Corps with the title of "Aeronautical Mechanical Engineer, Signal Corps Service at Large," and that he had no college education, was 20 years old and had worked three years for the Wright-Martin Aircraft Corp. He also told that he was not a flier.

Similarly Major Cushman A. Rice testified about British planes to the committee, the R. E., he said, was an experimental plane and very fast, and according to British experts here the R. E. is a two-seater artillery plane, neither fast nor experimental. He also told that Great Britain uses a 75-hp. Rolls Royce engine in certain planes, while the British authorities claim that no Rolls Royce of that horsepower has ever been made. Further confusing testimony was in the nature of that given by the French officers who told the committee that they did not like the De Haviland 4 because it was not a good fighting plane as well as an observation plane. Great Britain never intended the De Haviland for aught but observation work when it was designed, and such testimony tended only to confuse and mislead.

Discussing fatalities at flying fields in this country, Colonel Arnold told that after these commenced to increase a diagram was devised with curves, which showed that the majority of accidents occurred at 3 p. m., and he said: "I wish to state that as soon as we got that curve fixed up and found out that the majority of casualties occurred at about 3 o'clock in the afternoon, General Kenly said 'we will cut out flying at 3 o'clock' and so he stopped all flying between the hours of 11 a. m. and 3 p. m." The committee did not inquire if this stopped or reduced the casualties, nor why the greatest number of deaths occurred at 3 p. m. Since the greatest amount of flying took place at that hour, which is commonly recognized as the best flight hour, it is not surprising that the greatest number of accidents resulted at that time. It would be interesting to learn if the greatest "casualty occurrence" has shifted to some other hour, and if that hour is not now the one when most flights are made.

Another point in the general testimony that emphasizes itself to the reader is the absence of any testimony from those men who were most particularly interested and who were so severely criticized. The 1200 pages contain no statements either by Col. E. A. Deeds, Howard E. Coffin or others who were criticized by various officers and in turn by the committee when it compiled its report. There are several instances during the testimony where single individuals made statements harmful to the original Aircraft Production Board, and there is at least one instance where the word of one individual was accepted by the committee and incorporated in the final report to the detriment of the members of the Aircraft Production Board. And in consequence the impression remains that the men thus criticized were tried without a hearing, while the army officers and others who testified were given the opportunity to make these men appear guilty possibly of their mistakes.

Praise of the Liberty engine is frequent and convincing throughout the testimony. Henry Ford, W. C. Leland, R. H. Collins, C. F. Kettering and others testified that it was the "best engine they knew of." Major R. S. Brown, asked by Senator Reed if he knew of any engine better than the Rolls Royce, replied: "Yes, sir, the Liberty engine." Captain D'Annunzio, asked by Senator Chamberlain: "How about the power of the Liberty engine as compared with the Fiat, pound for pound?" replied: "The Liberty engine is better."

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Government Sulphuric Acid Plants

WASHINGTON, Oct. 19—Two sulphuric acid plants are to be erected in Pennsylvania under the supervision of the Construction Division of the Army, at a cost for both plants of $3,000,000. These plants will be operated by the Government. One will be located at Emporium and the other at Mt. Union.

The Emporium plant will consist of 8 units on a site which has been selected upon Driftwood Creek, close to the plants of the Aetna Explosive Company and the Emporium Iron Company. In the event that sufficient power cannot be obtained from the plant of the iron company, a one-thousand kilowatt-power plant will be erected. The estimated cost of this plant is $2,000,000.

The Mt. Union plant will be erected adjacent to the plant of the Aetna Explosive Company. Twenty acres of land have been purchased.

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Michigan Press Co. Reorganized

YPSILANTI, MICH., Oct. 19 — The Michigan Press Co. has been reorganized, Theodore H. Millington of Detroit becoming president; Charles W. Chapman, secretary-treasurer, and C. A. Perkins of Ypsilanti, vice-president. The first two named parties have a controlling interest in the company, Millington being an engineer who was formerly with the General Motors Co., and Chapman being a Detroit attorney. The company will continue to make the Perkins power presses and will bring out a new four-wheel drive tractor which Mr. Millington has perfected.

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New Mail Export Rates

WASHINGTON, Oct. 19—Under new regulations by the War Trade Board, articles shipped by mail to the United Kingdom, France or Italy, when not composed of samples of merchandise, will require individual export licenses and applications will have to be made for them. Hereafter, however, shipments can be made without individual export licenses through the mails of any commodity not on the official export conservation list when such shipments are destined to:

Abyssinia, Afghanistan, Argentina, Belgium, Bolivia, Brazil, China, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Egypt; the colonies, possessions, and protectorates of Great Britain; the colonies, possessions and protectorates of France; Guatemala, Haiti, Honduras; the colonies, possessions and protectorates of Italy; Japan, its possessions or protectorates; Liberia, Monaco, Mepal, Nicaragua; the colonies, possessions or protectorates of the Netherlands; Oman, Panama, Paraguay, Peru, Salvador, San Marino, Siam, Uruguay (excluding any portion of the foregoing occupied by the military forces of Germany or its allies), or shipments of samples of no commercial value, or any commodity, when such shipments are destined to the United Kingdom, France, Italy or Japan, their colonies, possessions and protectorates (excluding any portion thereof occupied by the military forces of Germany or its allies).

These shipments which can be made without the individual export license should have noted on the package the following:

"Shipped under export license RAC—52."
A statement of the contents.
Name and address of shipper.
Name and address of consignee.

Calendar

CONVENTIONS

Oct. 22-24—Atlantic City, N. J. Annual, Automobile Accessories Branch, National Hardware Association of the United States, Marlborough-Blenheim Hotel.

ENGINEERING

Nov. 14-15 New York. Society of Naval Architects and Marine Engineers. Twenty-sixth general meeting. Engineering Societies Bldg., 29 West 39th Street.

SHOWS

Oct. 12-19 — Atlanta. Tractor demonstrations Eastern State Fair and Automotive Exhibition.

Oct. 14-27—Dallas, Tex., Seventh Annual Texas Automobile Show. Texas State Fair.

Oct. 30-Nov. 4—Shreveport, La. Tractor demonstration. State Fair.

Nov. 11-16—Phoenix, Ariz. Tractor demonstration, State Fair.

Nov. 11-16—Pittsburgh, Pa. Fall Automobile Show. Motor Square Garden, Automobile Association of Pittsburgh.

Jan. 13-19 — Des Moines, Ia. First Tractor Show. Des Moines Thresher & Tractor Club. H. J. Clark, Mgr.